TECHNOLOGY DEPT.

Gas Journal

VOL. 285. 108th YEAR. LONDON, JANUARY 18, 1956. No. 4833 PRICE 1/6

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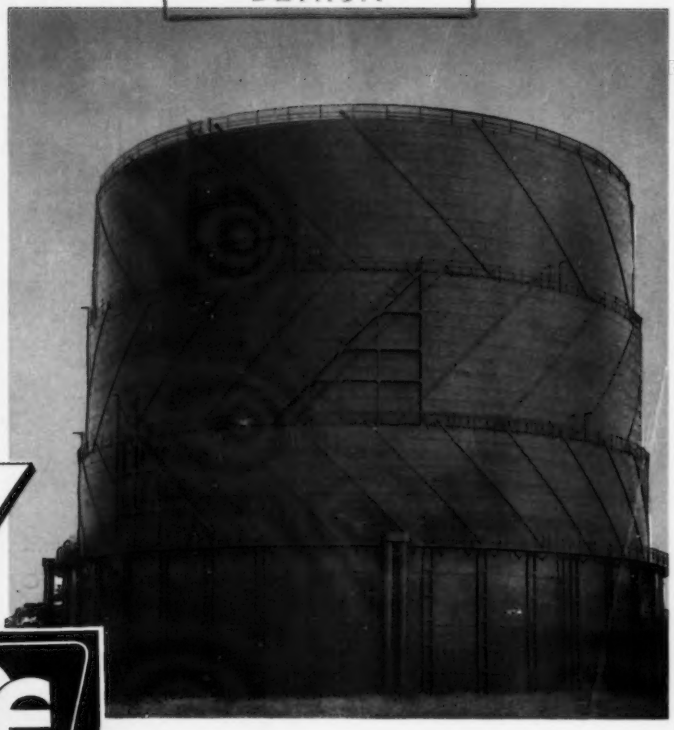
2 RECENT CONTRACTS



GASHOLDER. 3 lift, spirally guided, 1½ million cubic feet capacity, prepared for a fourth lift.

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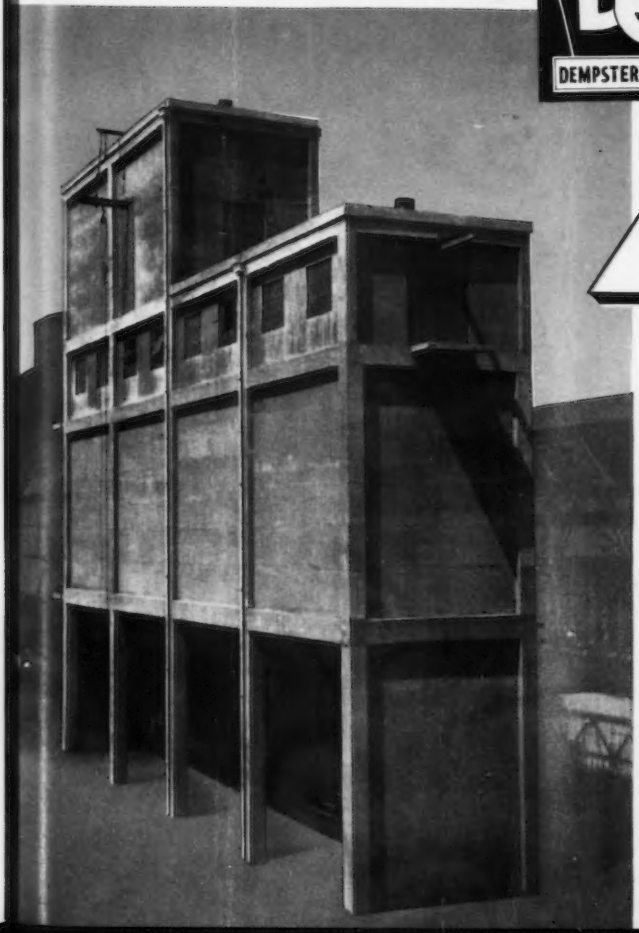

COKE HANDLING PLANT.

Coke Handling, Screening and Storage Plant, from a photograph taken whilst under construction.

by

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WHOLEPIECE AND SEGMENTAL TO GAS ENGINEERS' SPECIFICATION

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- CORROSION RESISTING STEEL DOOR.
- SPECIAL RESILIENT NON-METALLIC COMPOSITION SEATS SELF-LUBRICATED.
- SIMPLE AND ROBUST IN CONSTRUCTION.
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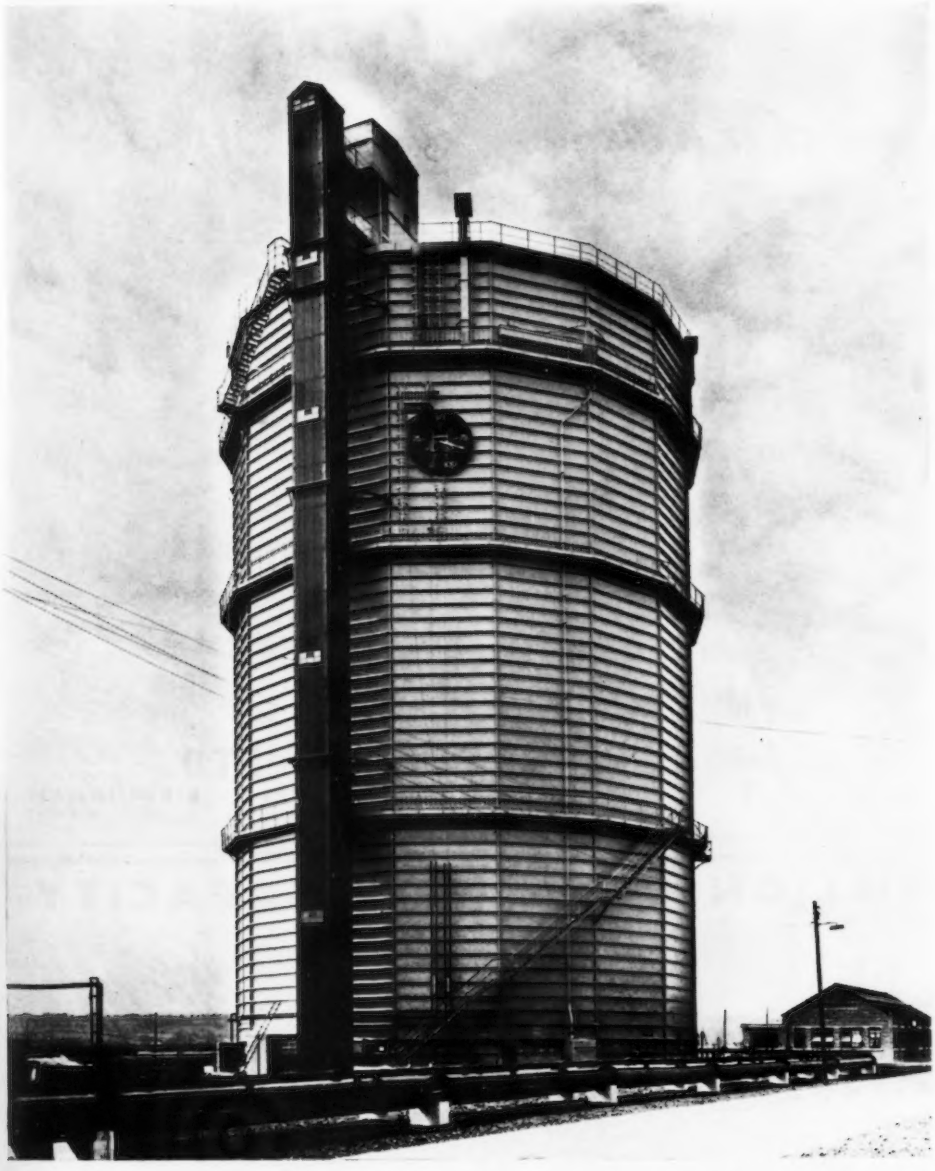

(The hallmark of high quality plant)

MODERN GASHOLDERS OF DISTINCTION

Illustrated above is one of our WATERLESS (M.A.N.) GASHOLDERS for the storage of Coke Oven Gas.
(Photograph by courtesy of John Summers & Sons Ltd.)

by

R. & J.

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Constructional Gas and Chemical Engineers

MAKERS OF HIGH QUALITY
BY-PRODUCT and CHEMICAL PLANT - CONDENSERS
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We also build FRAME-GUIDED, HIGH PRESSURE and SPIRALLY-GUIDED GASHOLDERS of RIVETED or WELDED CONSTRUCTION.

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Domestic and Industrial — Ordinary and Prepayment.

Strongly constructed from best-quality materials and produced under the most careful supervision.

Supplied with two-coin prepayment attachment at the option of either the Gas Undertaking or the Consumer.

One slot takes either coin.

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THREE MILLION CUBIC FEET CAPACITY

M·A·N

WATERLESS

GASHOLDER

under

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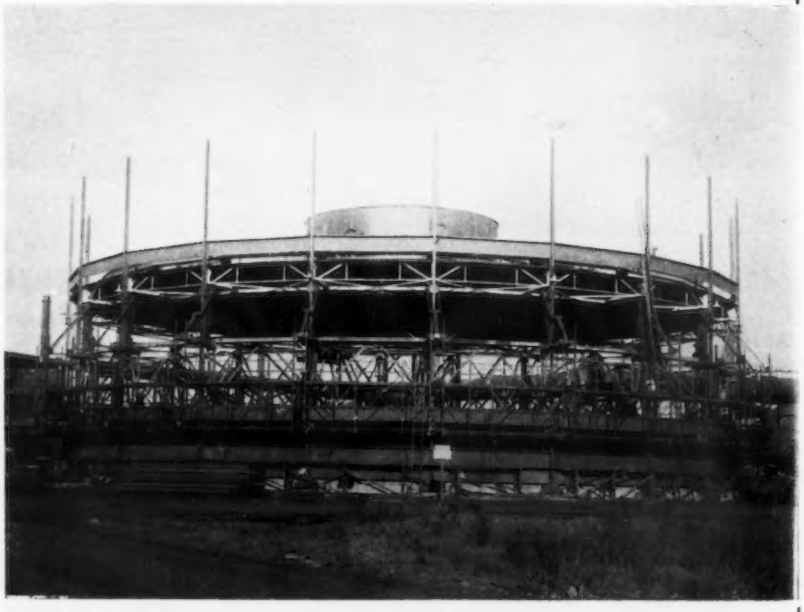
AUSTRALIA



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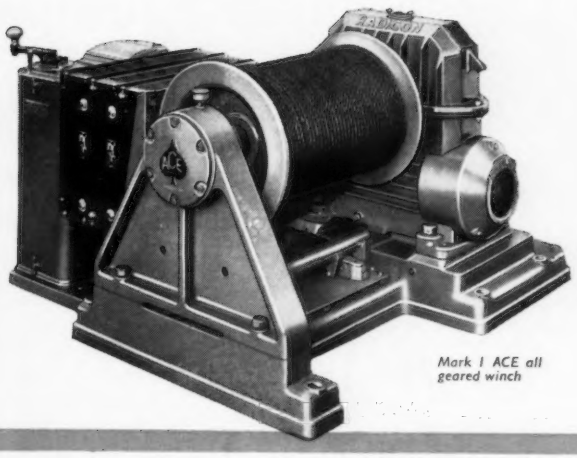
ACE
TRADE MARK

A WILLING WINCH FOR THE JOB . . .



Mark 1 ACE all geared winch

HEAVY DUTY STANDARDISED WINDING GEARS FOR ALL LIFTING, HAULAGE AND ERECTION

- Drum controller or push button.
- Capacities : ½ to 5 tons.
- Speeds can be arranged up to 300 ft./min.
- Strong rugged construction employing machine grooved rope drums and self-aligning ball bearings—a typical ACE job!
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Mark 2 ACE all geared winch with rope drum clutch and foot brake

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The Smaller Company can generally

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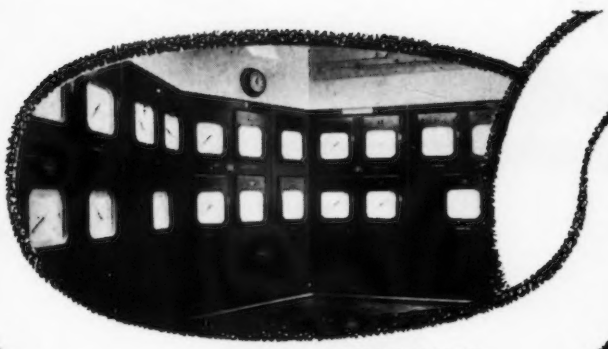


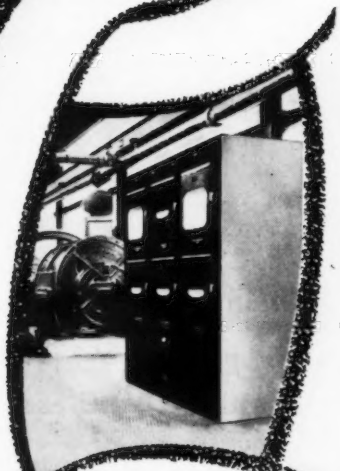
EASTERN GAS BOARD
Peterborough Control Panel

SOUTH EASTERN GAS BOARD
Brighton Control Panel

AS EACH LINK IS FORGED IN THE
CHAIN OF AREA INTEGRATION SCHEMES

ELLIOTT-BRISTOL'S Telemetering

IS SELECTED FOR AUTOMATIC CONTROL AND SUPERVISION

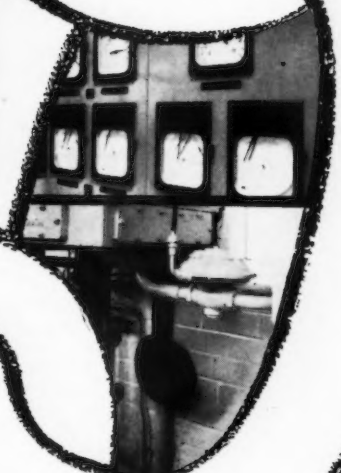


SOUTH WESTERN GAS BOARD
Bath—Calne Panel

PROJECTS IN HAND

- BRISTOL
- BRIGHTON-NEWHAVEN-SEAFORD-LEWES
- BRADFORD
- BATH-CALNE-TAUNTON-BRIDGWATER
- SUNDERLAND-BLYTH
- LINCOLN-HORNCASTLE
- PETERBOROUGH-CAMBRIDGE-BEDFORD

In addition to
SOUTH WALES GRID AND SOUTH LONDON MAIN SCHEMES



WALES GAS BOARD
Grid Control Scheme

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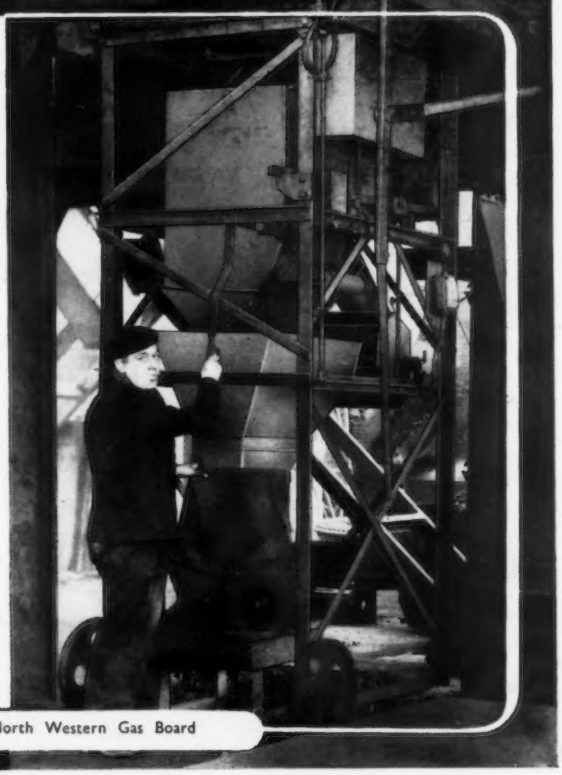

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DUST COLLECTOR

The 'Centicell' in combination with extraction hoods, is the ideal plant for eliminating the dust nuisance on coke-screening plant. The 'Centicell' can also be fitted at the inlet or outlet of waste-heat boilers, preventing the emission of dust from the chimneys of retort settings.

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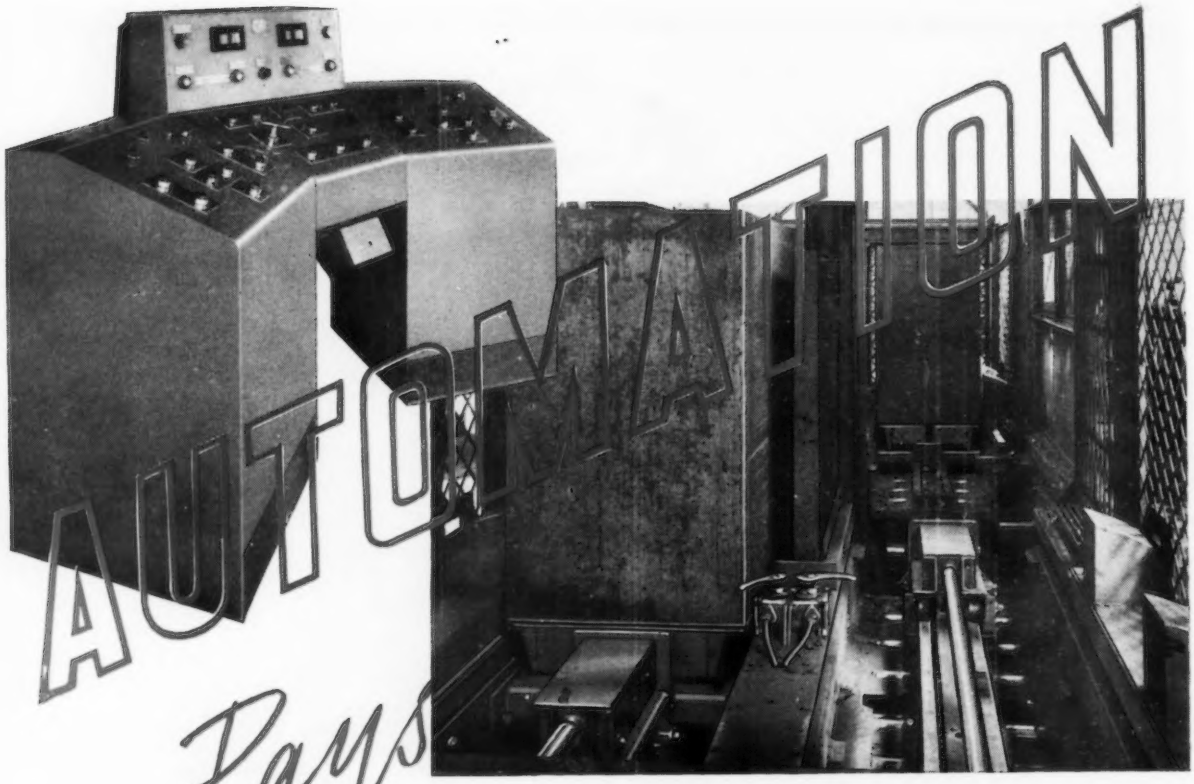

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AT RAWDON

	BEFORE re-organisation	AFTER re-organisation	
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ABOVE	66	8	MANPOWER BALANCE UPGRADED TO COAL-FACE WORK
BELOW	48	8	
NUMBER OF TUBS/CONTAINERS	650	6	INCREASED SAFETY WITH LESS MOVING MACHINERY
MAXIMUM TONNAGE PER HOUR	148.5	360	WOUND THROUGH ONE SHAFT INSTEAD OF TWO

THESE OUTSTANDING FIGURES—*reproduced by permission of the National Coal Board — illustrate the economy and efficiency of the Torley Container Automation powered and controlled by Keelavite Hydraulics at Rawdon Colliery in Leicestershire.*

Plan right with

Keelavite *hydraulics*

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not a relay race

The De La Rue 'Warwick' gas cooker cooks everything at once. It's a picture of smooth organization. You should recommend it for the family that likes to have a friend or two in to dinner now and then. Whatever the emergency the 'Warwick' can cope comfortably. Its five burners, eye level grill, and large capacity oven save time, save effort. Thanks to the 'Warwick' both food and cook reach the table in perfect condition.

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D.L.R. 525

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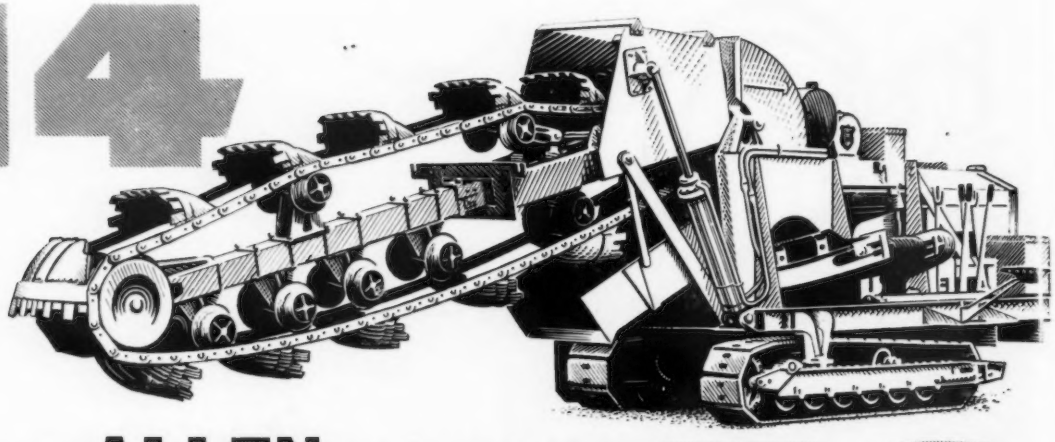

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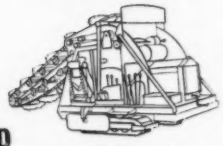
16-60 Trencher

12-21 Trencher

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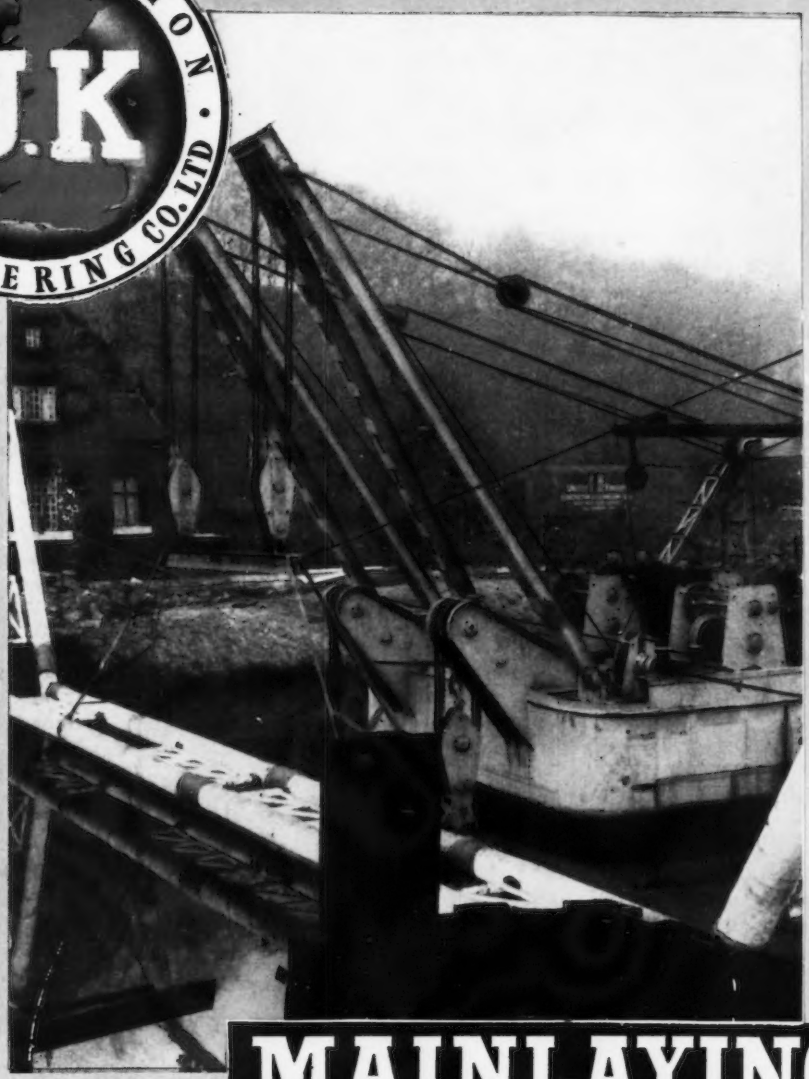

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FOR THE GAS INDUSTRY
IS OUR BUSINESS

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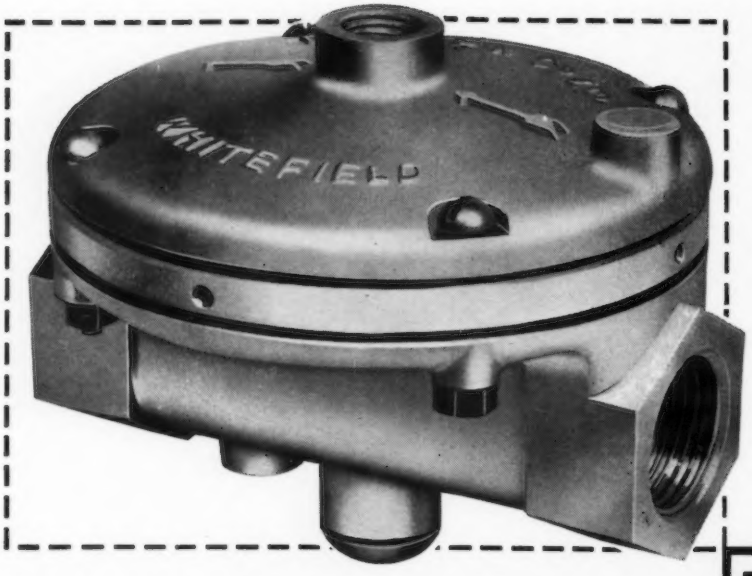

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- ★ Extremely reliable and economical

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- ★ Gas connections ¾" and 1" B.S.P. female (can be bushed for ½" if required)
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DRAKES of HALIFAX

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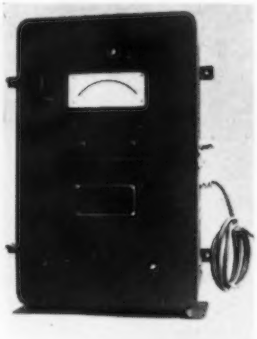

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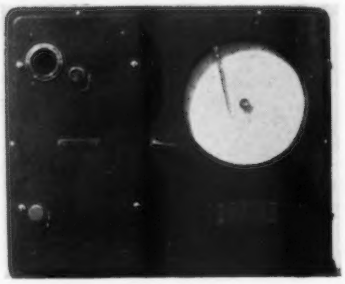

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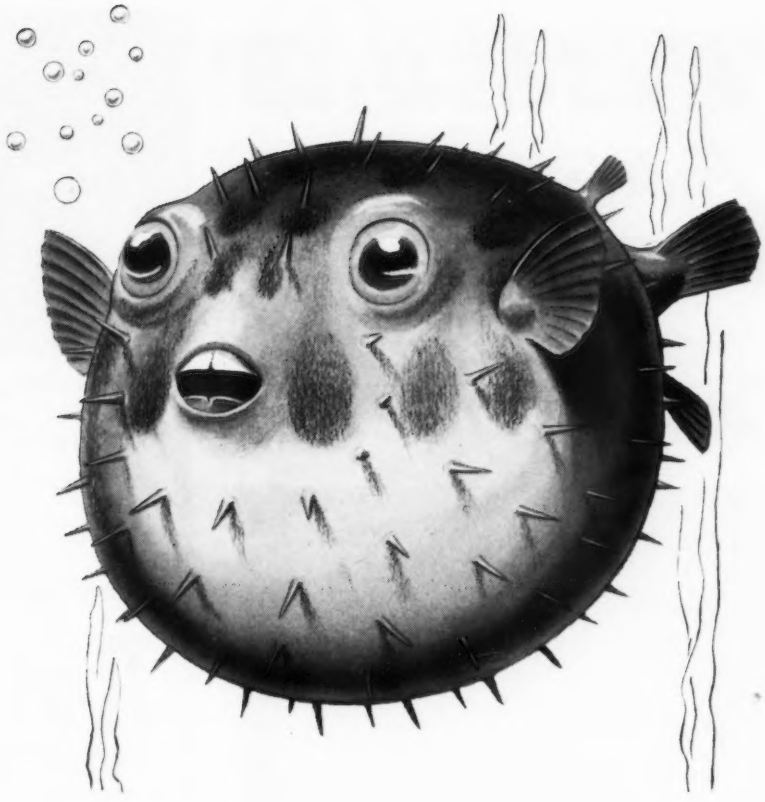
All wind and fish?



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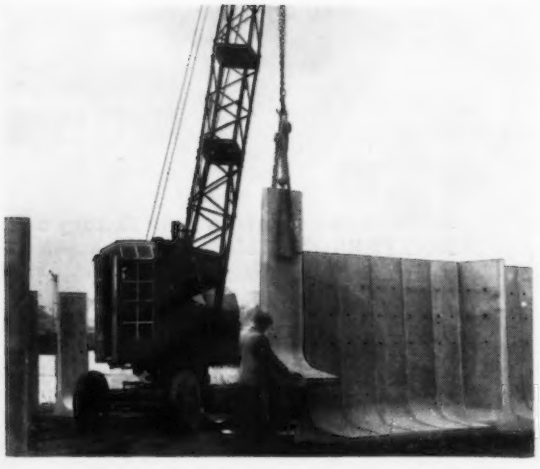
just a matter of hot air . . . or should it be cold bubbles



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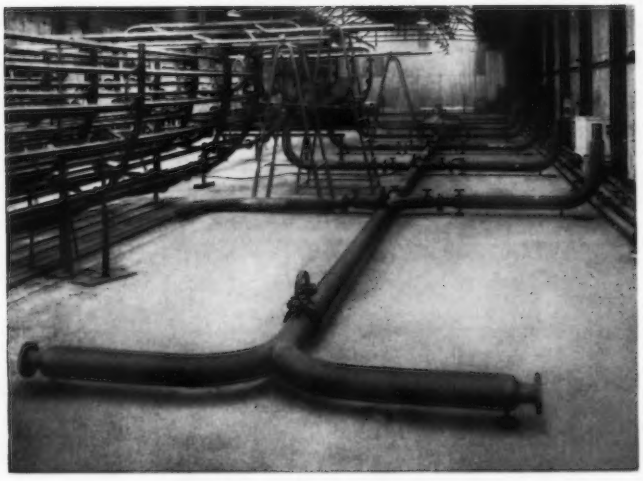

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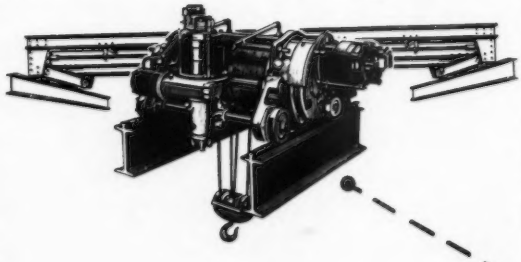
Between two points



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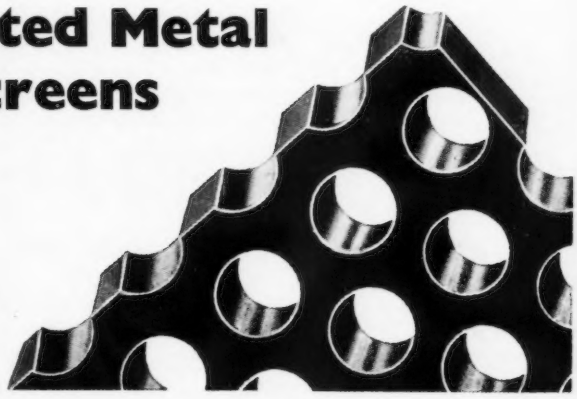

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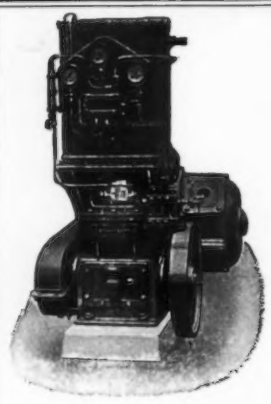

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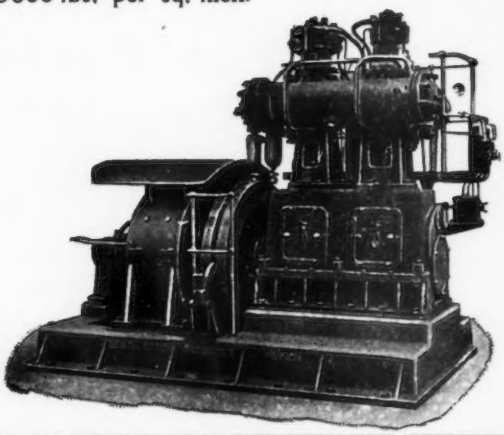

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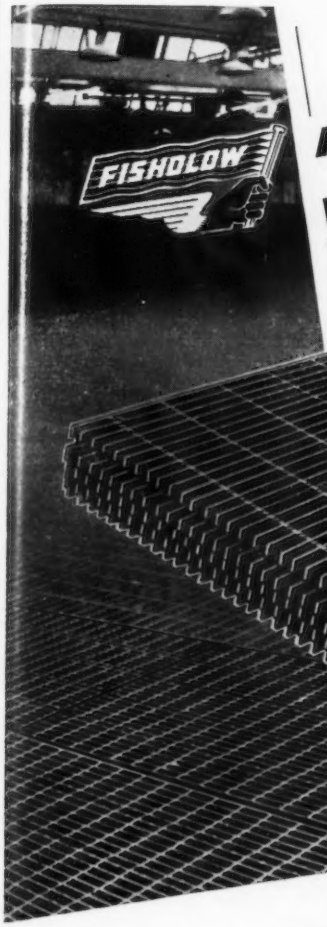

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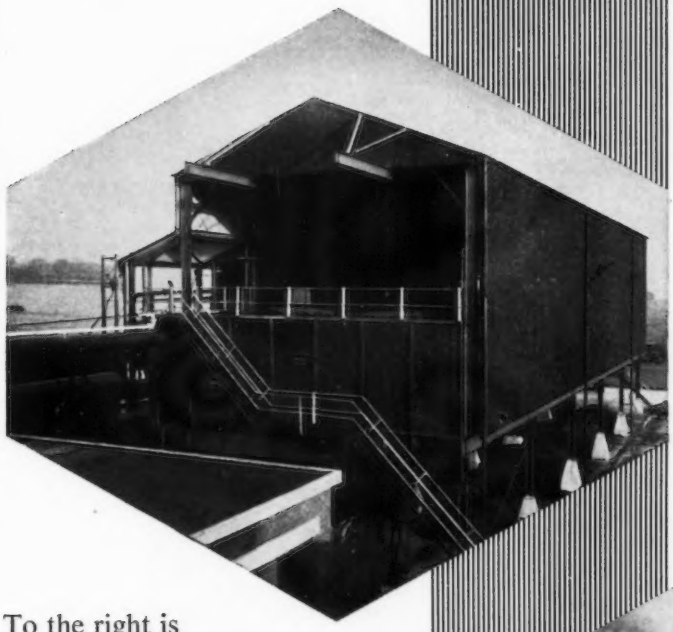
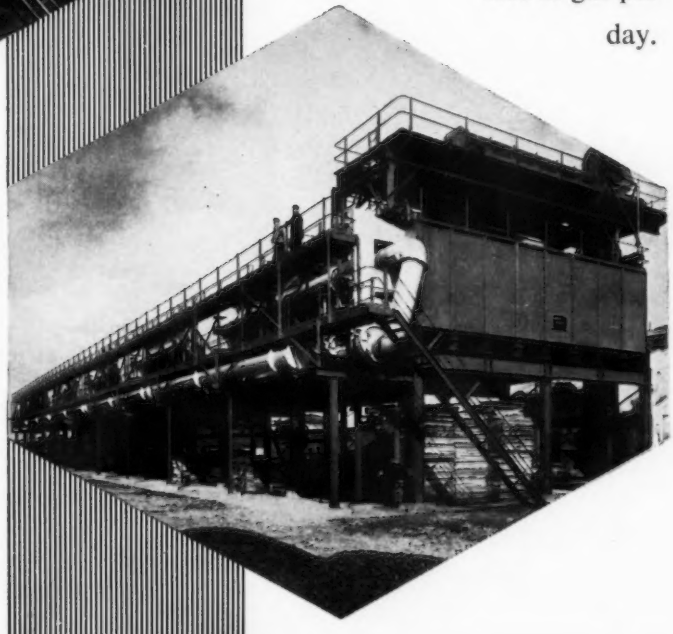


The recently completed installation to the left consists of five welded steel purifier boxes, each 24 ft. by 30 ft. by 10 ft. deep, which were designed, fabricated and erected by Whessoe for the National Coal Board at Stella Gill (Chester-le-Street).

The capacity of this installation is 4 million cubic feet of gas per day.



To the right is illustrated a 6 million cubic feet per day installation designed, fabricated and erected by Whessoe for the North Western Gas Board works at Warrington. It consists of five welded steel boxes, each 45 ft. 9 in. by 35 ft. by 10 ft. deep.

These two installations are examples of the wide range of gas plant made by Whessoe for the gas and coke oven industries.

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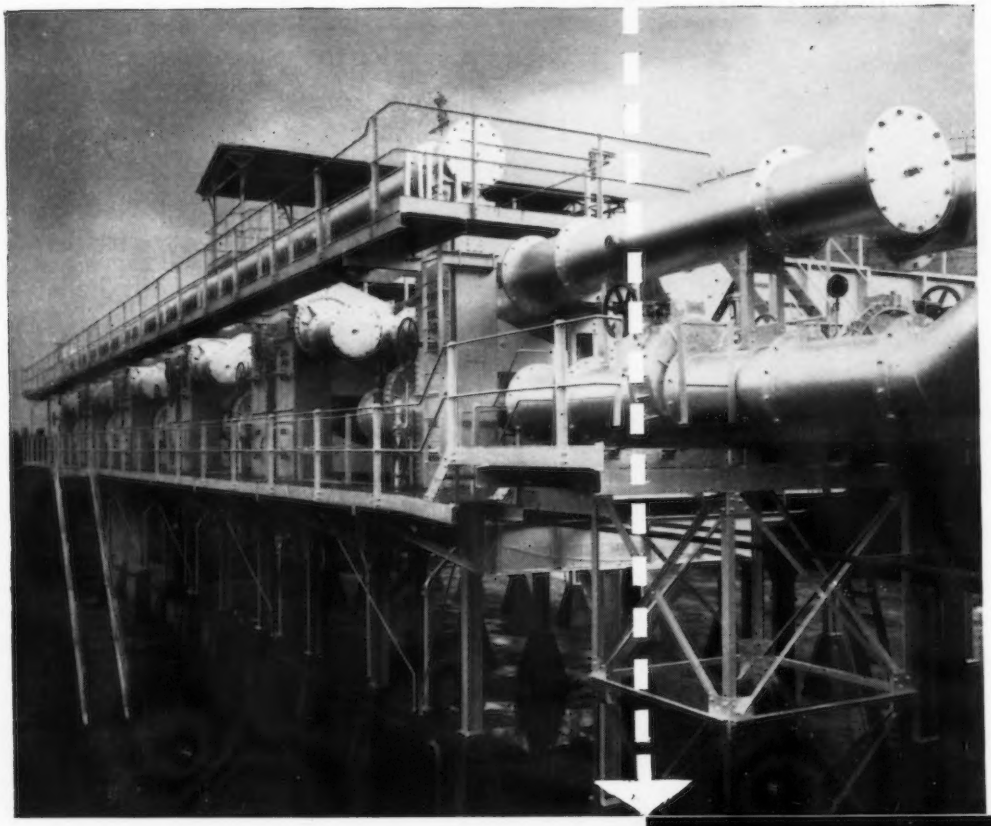

Wigan Deep Purifiers. Photograph by courtesy of the North Western Gas Board and The Oxley Engineering Co. Ltd.

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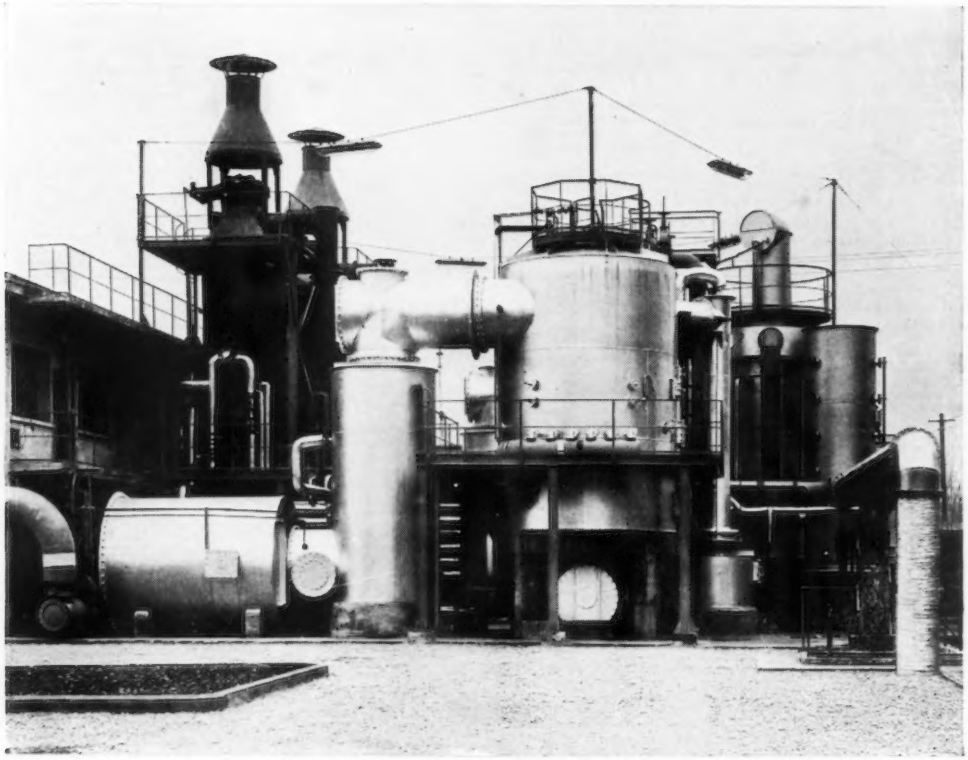

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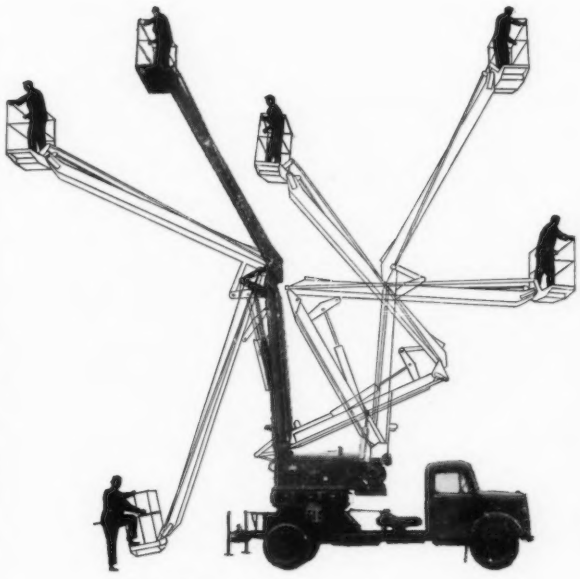

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108TH YEAR

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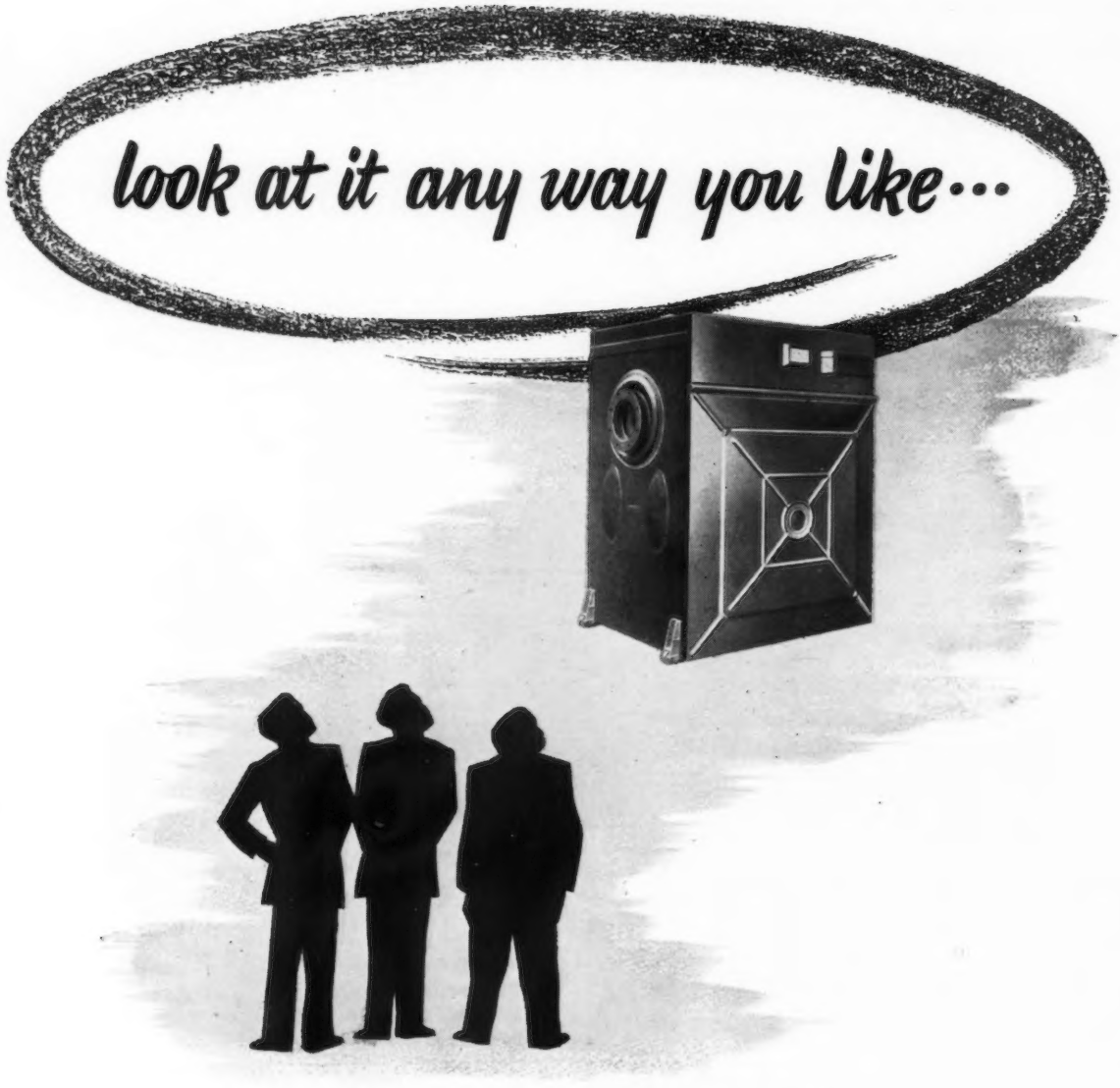

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(October-December, 1955)
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Gas Journal

VOLUME 285. No. 4833. JANUARY 18, 1956. 108th YEAR

Jam for the Bread and Butter Load?

A FEW weeks ago we happened to overhear a conversation between two gas engineers of some standing in the industry. One asked the other if he had read E. W. B. Dunning's paper to the Autumn Research Meeting on ' A Comparison of Fuels for Cooking.' The reply was ' No, I don't take much interest in that sort of thing.' A surprising answer if you think about it, because even allowing for the fact that engineers are busy men and there is much to occupy them in the changing scene of gas manufacture, it is surely necessary to bear in mind the purpose towards which their labours are directed. It is, above all else, to provide the fuel for cooking preferred by the majority of Britain's housewives. It is as simple as that, and any variation in the ' housewives' choice ' would have its effect upon the gas engineer and the whole of the industry he serves. For that reason the merits of cooking by gas are of concern to us all and although the non-domestic reader may be excused the intricacies of Mr. Dunning's encyclopaedic paper, he should, in our estimation, have some cognisance of the author's conclusions. Cooking is our bread and butter load. In the past we have had some jam with it, but will such a state of affairs continue? We therefore propose to devote our comments this week to ' A Comparison of Fuels for Cooking.'

The paper was based on a large number of laboratory-controlled tests at Watson House designed to assess the relative merits of gas, electricity and solid fuel for cooking. Early on the author points out that the gas cooker is a versatile appliance in that its consumption is often much larger than the actual consumption for cooking, due to its being used for water heating, etc. A single person uses 50 to 75 therms annually when using a cooker, an additional person adding 30 therms, the next 25 therms until the sixth additional person only adds 15 therms. The average household of 3.2 persons uses about 110 therms per annum. The decrease in the number of persons per household is suggested by Mr. Dunning as one of the reasons for decreasing gas consumption per household, but this is due more to increased longevity than fewer children. Over half the households in Britain have bought a new cooking appliance since the war. Mr. Dunning notes that ' It is the young housewife who chooses electricity for cooking, for twice as many of the under-35 age group use it compared with older women.' But he notes that in a number of independent enquiries about half the housewives preferred gas, rather more than a quarter electricity, and the remainder solid fuel. Gas was liked because it was ' quick ' and disliked because it was ' dirty '; electricity was liked because it was ' clean ' and disliked because it was ' slow.' Solid fuel was liked because it ' cooked better.' Mr. Dunning makes the valid point that the previous use of fuel is an important factor in choosing that fuel again, and a change may be desired because of some real or imagined lapse by the previous fuel service. Since there are many more gas cooker users there will be more chance of dissatisfied customers wishing to change to other fuels for this reason. The moral: ' The importance of good service cannot be over-emphasized.'

Quite rightly Mr. Dunning has given the greater part of his paper to comparison with electricity, and for this purpose a range of 18 electric cookers and hotplates of various kinds were compared with a range of gas appliances. Results show that there is a very wide range of measurements, from 14 units per therm up to 44 units per therm, depending on the conditions, which means a three-fold variation. These variations occur according to the plates and burners used, as solid or radiant plates, machined base or ordinary vessels, and such other things as the use of residual heat, high-rated or low-rated gas burners, and individual differences between appliances. The author has shown the worst gas appliance against the best electric, and the worst electric compared with the best gas. If they are all averaged out a figure is obtained something like 22 or 23 units per therm. Results of tests comparing electric kettles with gas hotplate burners show that here the position is more favourable to electricity. Since this is quite an efficient electrical appliance a reasonable figure is 17 units per therm. If, however, on the gas hotplate a finned base kettle is used, which gives a higher efficiency, the figure can be brought back to about 22 units per therm. Comparing gas and electric grills for toasting, gas is shown to be quicker and there is an approximately equal area of toasting. Efficiency figures show that the average is about 22 units per therm, but there is something like a three-fold variation from 12 to 30 units per therm de-

pending on the individual appliances. Taking the newer radiant type of grill the efficiency is a little lower for grilling, but when we consider the use of those grill-boiling plates which combine grilling and boiling in the same operation, the normal grilling and boiler plate is very much less efficient than the other parts of the electric cooker. A figure of something like 40 units per therm is given as the average efficiency for boiling only when used just as a boiling burner, as may often be the case, because there may be only one or at the most two other boiling burners available on the hotplate. The new radiant grill-boiling unit is however a very powerful competitor, giving an efficiency for boiling very similar to the ordinary radiant plate—something like 23 to 25 units per therm. Electric table toasters are very efficient compared with gas or electric normal grills, giving a comparison of 7 units per therm, but the author points out that they can be used only for making toast, and the additional capital cost involved must be considered.

A comparison of the cooking performances of gas and electric ovens for various purposes reveals that although some of the electric ovens are as good in cooking quality as gas ovens, the general quality is rather lower. Again a figure of about 22 units per therm is obtained, with a range depending on the kind of oven and the purpose to which it is put. Very long-period cooking is favourable to electricity, whereas short-period cooking is favourable to gas. Mr. Dunning has given the units per therm for the various cooking operations and has set out comparisons of overall efficiency depending on how much one uses the various parts of the cooker and the various conditions, such as whether one uses finned-base vessels or not, large or small boiling burners, and so on. He gives a range from 34 units per therm down to 20 units, and points out that the variation can be wider than that. If all toasting is done on an electric toaster, a figure of 7 units per therm is obtained, but if a grill-boiling unit is used all the time a figure is obtained which is much more advantageous to gas. It is obvious that there is no single answer to the question of which is cheaper; it depends on the conditions of use in the various cases.

Characteristically Mr. Dunning is meticulous in his examination, contrasting ease of cleaning, wall and ceiling staining, surface temperatures, maintenance, ignition (even the numbers of matches and price of flints are taken into consideration), and an important section is devoted to comparative consumptions.

Solid fuel is granted a smaller but nevertheless formidable section. Here the position is complicated because it is necessary to compare the solid fuel cooker which normally does cooking, water heating and space heating, with a gas cooker plus some other appliances using solid fuel for these other purposes, whether a domestic boiler or an open fire with a back boiler. In comparing the results he has pointed out that the gas cooker is more flexible and gives speedier boiling than solid fuel cookers, except perhaps the heat storage cooker first thing in the morning. It is interesting to note that the cooking quality is shown to be rather inferior to gas cooking, even when extra manipulation is carried out. What is even more interesting is the result of tasting tests designed to ascertain whether there was something about cooking quality in a solid fuel cooker with which no other method of cooking could compare. That is a commonly held belief, but in Mr. Dunning's tests, using both trained and untrained observers, no difference *statistically* between the various fuels could be found.

A New Approach

RECOGNIZING the fact that this paper is of fundamental importance, particularly to the sales side of the industry, the major part of the January issue of 'GAS SERVICE *and Domestic Coke*' has been devoted to it. For those who feel hesitant about plunging into the formidable bulk of the I.G.E. 'blue book' we would respectfully suggest that this, our sister journal, provides a convenient answer. Not only is the Dunning paper reduced to well under half its original length, it is complemented by a full report of the discussion at the Autumn Research Meeting and by the publication of three articles contributed by 'interested parties.' The discussion was remarkable for the comments of Dr. Harold Hartley on the effects of nationalisation on cooker manufacture and the urgent need for a review of the sales policies of nationalised industries, and for the commonsense remarks of Mrs. Hilda Whitlow (of 'Homes and Gardens'). After putting up a spirited defence of the solid fuel cooker and commenting on the relative merits of gas and electricity she neatly summed up the advantages of gas from the housewife's point of view: Immediate heat, fine control, quick adjustment, and visible heat. Copywriters please note.

Of the three articles to which we referred one is by the Technical Manager of the Coal Utilization Council, Mr. W. C. Moss, who argues that where hot water demands are not too much more than the Egerton minimum standard of 250 gal. a week, a free-standing solid fuel cooker can provide them, and all the cooking, with only one fire to stoke and one appliance to clean. Electricity is represented by a regular contributor whose pen name 'Taurus' cloaks the identity of a well-known figure in the electrical world. His principal argument, put forward tongue in cheek, is 'Surely the great gas industry is not so afraid of its competitors that it needs to measure itself against them?' And he dismisses the question of operating cost as being of little importance today. One point mentioned in his article (in favour of gas, oddly enough) which is worth mentioning is the psychological advantage of the hiss of the gas boiling burner which 'sounds as if it is already making the pot begin to boil as soon as it is lit.' Curiously enough, a little thing like that is more likely to sell appliances than all the might of Mr. Dunning's logic. Lastly, the feature known as 'Woman's Viewpoint' puts forward the feminine slant on Mr. Dunning's paper. During the article the writer makes a plea for removable oven linings, automatic hotplate and oven ignition in all gas cookers, and some effort to be made to persuade makers of cookery utensils to design their products in such a way as to ensure the best and most efficient results with gas. And, like other critics, she mentions the possible wide divergence between the results obtained in laboratory tests and by the average housewife in her home.

The subject of this battle of the fuels is both fascinating and, for us, vital. After his prolonged scientific wanderings in Cloud Cooker Land, Mr. Dunning finally

reaches home with the declaration that despite this and that, gas is still the ideal fuel for cooking. We feel sure that he is right, but equally we feel sure that gas has won by only a short head—and that Mr. Dunning knows it. Given fairly stable market conditions with a minimum of interference by the Chancellor, the next ten years may be the most critical yet in the gas industry's fight to retain its advantage in this field. There can surely be little doubt that in technical invention and in the race for perfection electricity is overhauling gas at a fair rate of knots. The answer lies with the manufacturers of gas cookers. If they continue to produce 'new' models which are basically old models with no greater claim to attention than some insignificant feature of outward design, the rivals will draw level. The situation would seem to call for more than a new look; what is required is a new approach to the whole question of cooker design. It would be interesting to put the problem to some of the inventive minds who have produced revolutionary designs for other, quite different products and who have not so far addressed their talents to the domestic cooker. It may be that the recognized and traditional principles of cooker design may yield to the challenge of new thought as have other apparently firmly rooted conceptions of design in other fields. What is called for is something more than a sales gimmick (such as clock-control cooking, for example), although gadgetry is not to be despised. We need the services of scientists and inventors who will set out to evolve an attractive and efficient cooking appliance without so much as a sideways glance at what has been done before. The doubters shake their heads. May we remind them that such things have happened elsewhere in other, less conservative, industries.

GAS IN AUSTRALIA

THE gas industry in Australia is several years younger than that in this country, but the impression one derives from a perusal of the *Transactions* of the Australian Gas Institute for 1954 just to hand is that it is certainly no less modern in its appreciation of present problems and future possibilities. The volume contains a full record of many informative papers and discussions at the annual general meeting and the northern and southern sectional meetings and is produced by the Institute with financial assistance from the National Gas Association of Australia. The President for 1954 was Mr. H. M. Turner, who received his early training at Eastbourne and went to Australia in 1925. He is now Manager of the Albury undertaking of the Gas Supply Company.

The industry, said Mr. Turner, had received a much more favourable Press than in previous years. Relief from the crushing effects of continued rises in coal costs had been secured; in fact there was an indication of a slight reduction in coal costs in the near future, and some companies had already made concessions in gas prices. Over 7,000 gas cookers had been sold by the Australian Gas Light Company in five weeks but some of the effects of such figures had been lost because they had not been made known to the general public. That was the kind of information they must get over to the public, and with a little co-operation it could be done.

COMPLEX OR SIMPLE?

IN this issue of 'GAS JOURNAL' we publish an article on the gasification of oil, which was first published in 1819. Our reason is not simply one of antiquarian interest, nor is it to show that the concept of gas from oil is not entirely new. Instead, we publish the article in an attempt to make our readers stop—and think.

It is said that Mr. William Petter, Managing Director of Folland Aircraft Ltd., designed the Folland 'Midge' as a result of his desire to move away from excessive complexities in design. He had recalled that earlier aircraft had been models of simplicity, and although the their performances and appearances must now be considered archaic, their cost (and cost is of supreme importance in any form of progress) had been almost infinitesimal compared with the cost of modern aircraft. The reason was clear. Nearly every new design had been supplementary to previous designs, instead of complementary. The complexities of new designs had added to the complexities of past designs until eventually the cost of a single fighter 'plane was approaching the £100,000 mark. By starting again from basic principles, Petter was able almost to quarter the cost of a fighter, and he produced the Folland Midge which, in design, was far removed from any other modern, or historic, aircraft. It has also roused considerable interest among the export markets. The Petter example might have its analogies in every other industry where progress seems to take the form of development rather than re-invention. We would not be so stupid as to advocate the return to methods of a century and a half ago, but we would suggest that technologists should look back on those methods just once in a while. They might then see how simple and cheap a business industry used to be. It could be that some of them, at least, would be stirred to a little re-invention, or simplification, of great industrial processes.

Correspondence

AWARD FOR GALLANTRY

DEAR SIR,

The Felixstowe explosion bears witness to the many acts of courage and fortitude displayed by gas men and women and by those who come to their aid in peril and adversity.

Is not the time opportune to create an 'Award for Gallantry in the Gas Service', which would enable the Industry to acknowledge, with gratitude and pride, acts of exemplary gallantry rendered to the Service or its servants?

Courage mounteth with occasion; such is the way to the stars.

Yours obediently,

J. R. W. ALEXANDER.

Castlefield,
Reigate,
Surrey.
January 16, 1956.

ADVERTISING NEIGHBOURS

DEAR SIR,

For many years the page of advertising facing the leading article in the 'GAS JOURNAL' has been shared by Messrs. Thos. Glover and Parkinson and Cowan. This has now been altered. Would you please tell an interested reader for how many years this association has continued?

Yours faithfully,

'OBSERVER.'

January 12, 1956.

Thos. Glover's first advertisement appeared in the 'JOURNAL' dated March 19, 1859. They were joined by Parkinson on February 12, 1861.—Editor.

Personal Notes

SIR CHARLES ELLIS, F.R.S., has been appointed Scientific Adviser to Charrington, Gardner, Locket and Co., Ltd., distributors of coal, coke and fuel oil.

MR. F. B. KERR, Manager of the Scottish Gas Board at Elgin for the past ten years, has been appointed to a similar position at his native Johnstone, in Renfrewshire.

MR. E. C. MENGEL, Chairman of Humphreys & Glasgow Ltd., has retired after 51 years of service with the Company. Elected a Director in 1925, Mr. Mengel became Chairman in 1952, following the retirement of Dr. A. G. Glasgow, founder and first Chairman of the Company.

MR. G. E. RICHARDS, Branch Manager of The Morgan Crucible Company Ltd., Birmingham, will retire at the end of March, 1956, after 40 years' service. MR. D. SCOTT, Deputy Branch Manager for the last two years, will succeed Mr. Richards on April 1, 1956.

MR. RICHARD B. REYNOLDS, who has been appointed Sales Manager for both George Wilson Gas Meters Ltd., and Radiant Heating Ltd., for the North of England, is now to be responsible for Scotland. Representatives assisting Mr.

Reynolds will be MR. A. J. VERNON, whose headquarters are in Manchester, and MR. J. L. THOMSON, whose headquarters are in Glasgow.

Obituary

MR. S. J. MATTHEWS, Head of the Research and Development Division of Baird & Tatlock (London) Ltd., died on January 2. SIR BERNARD KEEN, D.Sc., F. INST.P., F.R.S. is temporarily taking charge of the Research and Development Division.

Diaries and Calendars

The Editor acknowledges with thanks the kind gifts of diaries and calendars from the following: Adlard & Son., Ltd., Ascot Gas Water Heaters, Ltd., British Vacuum Co., Ltd., Darien Press Ltd., Drakes of Halifax, Ltd., East Midlands Gas Board, Electrolux Ltd., Gas Council, R. & A. Main, Ltd., J. C. Neville, Ltd., Standard Furnace Co., Ltd., Stewarts & Lloyds, Ltd., Straker Bros., Ltd., Richard Sutcliffe, Ltd., Wellman Smith Owen Engineering Corporation, Ltd., Widnes Foundry Ltd., Hugh Wood & Co., Ltd.

Diary

January 19.—MIDLAND JUNIORS: Half day visit to works of Quasi-Arc Co., Ltd.

January 20. — INCORPORATED PLANT ENGINEERS, BLACKBURN BRANCH: 'Smoke Abatement,' J. Lewis, Golden Lion Hotel. 7.30 p.m.

January 20.—JUNIOR INSTITUTION OF ENGINEERS: 'Some Notes on the Flow of Plastic Solids,' R. F. Twist. Pepys House, 14, Rochester Row, London, S.W.1. 7 p.m.

January 21.—LONDON AND SOUTHERN JUNIORS: Visit to Willoughby Lane Works, Eastern Gas Board.

January 23.—WEST MIDLANDS G.C.C.: Gas Offices, Edmund Street, Birmingham, 3. 2.30 p.m.

January 25. — EASTERN JUNIORS: 'Through Way for Gas,' Mr. Forsythe. Ipswich.

January 26.—INSTITUTE OF FUEL, EAST MIDLANDS SECTION: 'Recent Developments in Fuel Technology,' Prof. A. L. Roberts. Gas Showrooms, Lecture Theatre, Nottingham 6.15 p.m.

January 26. — INSTITUTE OF FUEL, MERSEYSIDE SUB-SECTION: Programme of technical films. Liverpool Engineering Society's Rooms, 9, The Temple, Dale Street, Liverpool. 7 p.m.

January 27.—JUNIOR INSTITUTION OF ENGINEERS: 'Principles of Fuel Technology,' J. T. Veryard. Pepys House, 14, Rochester Row, London, S.W.1. 7 p.m.

January 31.—SOCIETY OF INSTRUMENT TECHNOLOGY: 'Industrial Measurement of Gas Temperature,' A. M. Godridge, R. Jackson, and G. G. Thurlow. Manson House, Portland Street, W.1. 6.30 for 7 p.m.

February 3.—INSTITUTE OF FUEL, SOUTH WALES SECTION: 'Research at the National Coal Board,' Dr. W. Idris Jones. South Wales Institute of Engineers, Park Place, Cardiff. 6 p.m.

February 5.—LONDON AND SOUTHERN JUNIORS: 'A Review of Post-War Domestic Gas Water Heating,' G. E. Johnson and C. H. Taylor. 178-180, Edgware Road, London, W.2. 6.30 p.m.

February 7.—MIDLAND JUNIORS: Paper, 'Some Aspects of Dry Purification,' S. C. Porter.

February 7.—SOUTH EASTERN G.C.C.: Caxton Hall, Westminster, London, S.W.1. 10.45 a.m.

February 8.—INSTITUTE OF FUEL, NORTH WESTERN SECTION: 'Some Recent Advances in Fuel Research,' Dr. W. Idris Jones. Joint meeting with National Smoke Abatement Society (North Western Division). Engineers' Club, Albert Square, Manchester. 2.30 p.m. (Members' luncheon 1 p.m.).

February 10.—SCOTTISH JUNIORS (WESTERN): 'Modern Control Equipment,' Gas Showrooms, 522, Sauchiehall Street, Glasgow, C.2. 6 p.m.

February 10.—INSTITUTE OF FUEL, EAST MIDLANDS SECTION: Annual Dinner. 'Black Boy,' Nottingham, 6.30 p.m. for 7 p.m.

News in Brief

The Petroleum Films Bureau claims 64,873 film showings during 1955.

The Corporation of Secretaries' new headquarters at Devonshire House, Devonshire Street, London, W.1, are to be opened by the Lord Mayor of London on February 3.

The Wales Gas Board Choral Society, formed in September, 1955, gave its first public performance on December 15 to a capacity audience in the Temple of Peace, Cardiff, consisting of a Christmas recital of words and music.

The Scottish Board for Industry has made a direct appeal to 2,500 Scottish firms asking them to join in the Save Fuel' drive and to consider the Ministry of Fuel and Power appeal to save 250,000 tons annually.

Ten Anglers from the South Eastern Gas Board spent a whole night on Folkestone Beach over the Christmas holiday. They were the only ones brave enough to face the bad weather conditions in the Board's competition.

Fielden Electronics, Ltd., industrial instrumentation specialists of Wythenshawe, Manchester, have recently opened a Midlands office at 18, Wolverhampton Street, Dudley, Worcs. The engineer in charge is Mr. F. Bernard Price.

Alder & Mackay, Ltd., gas meter manufacturers and street lighting engineers, announce that in future their London address will be 10, Gundulf Street, Kennington, S.E.11, telephone RELiance 3095. This address will deal with all enquiries for the Southern Area and Wales.

Sir Harold Smith Opens First 1956 Management Course

Sir Harold Smith, Chairman of the Gas Council, and Mr. W. Robson Brown, Chairman of the Governors, Brooklands College, chat with some of the students at the opening of the first of the 1956 Courses in Management and General Subjects organized by the Gas Council at the Brooklands County Technical College, Weybridge, Surrey.

HIGHER WAGES—NOTHING WRONG IF . . .

Purchasing Officers' View

The Economic Survey Committee of the Purchasing Officers' Association in its annual business report says organized labour is now better off than it has ever been for purchasing power, but it fails to realize that, without at least a compensating increase in production, the real value of wages would diminish.

High wages are not inimical to national prosperity provided restrictionary practices are thrown overboard and the drive for greater productivity pressed forward. Output per man in 1955 rose by about 3%, but wage rates increased by about 7%. As import prices rose by about 3% it is clear that prices moved upward because of home effects. If stability of prices is to be achieved there will, says the report, have to be an immediate and sustained improvement in the efficiency with which our high-cost labour is used. While this is primarily a management problem labour shoulders the responsibility of complete co-operation. Employers, including nationalised industries and services, will have to resist unreasonable wage demands. There must be no tendency towards acquiescence on the grounds that strikes during periods of prosperity are costly, as this would be inimical to the long term interests of the national economy.

For purchasing officers 1956 is likely to present some difficulties, but there is every likelihood that as the year progresses they may well regain some control of the market. From recent company returns it is evident that profits are rising more slowly than turnover; the immediate inference is that markets are steadily becoming more competitive. In such conditions pressure for supplies will run alongside pressure for lower costs of purchased materials; this will necessitate caution in forward buying and inventory policies in order not to be caught long if the market falls, even should the movement prove only slight.

The report says no early improvement in the steel situation can be expected; in fact, many suppliers of manufactured goods are now qualifying delivery quotations 'dependent on steel being available.' Other shortages have been brass stampings and pressings, building bricks and some types and sizes of ball and roller bearings. Probably due to the favourable weather conditions during the latter half of the year, there were no reports of shortages of coal or coke. The gas industry, due to high price and difficulty in obtaining the right quality of coal turned more to the use of oil for gas production, as well as considering the use of refinery waste gases and the import of liquefied natural gas.

Due to the credit squeeze and a steadfast refusal to embark on a policy of panic buying, inventories remained generally steady throughout the year. This represented an attempt on the part of purchasing officers not to intensify the disequilibrium of the company. The general intention is to pursue this policy as far as possible, but shortages and long dated deliveries are adding to the difficulty of maintaining tight inventory control.

Incorrect Grate-fixing Responsible for Many Coke Complaints

The most common cause of all complaints about coke was incorrect fixing, said Mr. W. C. Moss, of the Coal Utilization Council, at a recent meeting of the London and Counties Coke Sales Circle.

'Sometimes people complain of fumes from coke,' he said, 'I usually generalize by saying that you will get fumes from coke into a room where you would get fumes if coal were to be used. You get the type of man who is troubled with a smoky fire and decides to cure it by fitting a modern grate and burning coke. Dim-wittedness of that kind really does exist.'

Mr. Moss continued: 'Less obvious is the case of the stove, whether openable or closed, which is fitted with a back outlet pipe which passes so far through the closure plate that it almost touches the firebrick, and the restriction will not pass all the flue gases when the stove is working hard, or when it is just lit up.

'Faulty fixing of this kind soon becomes obvious because it annoys the user and he does something about it. Less obvious are some of the faults which do not actively annoy, but which simply result in a poor or disappointing performance. Then the user does not know how much better it could be and simply says it is a poor appliance or poor coke. Somebody once said that a part efficiency is worse than none at all. If a person gets no result he knows something is radically wrong. If he gets a partial result he often does not realize that he could do better.'

N.W.G.B. Fined £5 for Below-pressure Gas

The North Western Gas Board, summoned by the Ministry of Fuel and Power, were fined £5 at Church, near Accrington, magistrates' court on January 5, for supplying gas not at the prescribed pressure.

It was stated that an inspector who detached a chart from a recording instrument at Oswaldtwistle gas showrooms found that over 1½ hours on one day pressure had fallen one-fifth. An employee responsible had not made a test of the water level and this restricted the flow of gas.

Said Mr. F. Beezley, who prosecuted for the Ministry: 'Where there is a breach of regulations by a public body it is right that it should be brought before the magistrates and not covered up.'

TWO HUNDRED FRIENDS SAY 'GOODBYE FREDDIE'

The retirement of Mr. F. C. Smith from his position as Secretary of the Watson House Centre after half a century's service with North Thames Gas Board was marked on December 30 by a double presentation ceremony held at Watson House.

More than 200 friends and colleagues from many departments of the Board and from the gas industry in general came along to say goodbye to 'Freddie'. They saw Mr. L. W. Andrew, Manager of Watson House, present him with a desk and an illuminated address from his North Thames colleagues. Then, on behalf of well-wishers in other Boards, and in particular members of Committee who meet at Watson House, Mr. A. V. Horsfall of the West Midlands Board presented Mr. Smith with a camera and flashlight attachment.

Left: Mr. Smith tries out his camera and flashlight after the presentation ceremony. Mr. Andrew is with him in the picture.

EAST MIDLANDS' SIMPLE HIRE BAN

Result of 'Butler Squeeze'

The East Midlands Gas Consultative Council, at their meeting in Nottingham on January 3, received a letter from the East Midlands Gas Board announcing a ban on the hire of gas appliances. As the letter only arrived in time to be read at the meeting, the Council decided to defer discussing the matter until their meeting in March, in order to give the divisional committees opportunity to give it their attention.

The letter from the Board stated: 'As a result of the present restrictions on capital expenditure, the simple hire of appliances by the gas and electrical industries will largely cease. In conformity with this decision, as from today, the Board will cease to hire new or reconditioned appliances not previously let on hire. The reselling of reconditioned appliances previously let on hire will continue.

'A few hiring agreements exist, more particularly with housing authorities, in which a period of notice to terminate is involved. In the main, these agreements will be suspended on March 31, 1956.

'As the Council know, simple hire has always formed only a comparatively small proportion of the business done by the Board. Most consumers have preferred to pay for their appliances.'

The Board, in a statement on meter rents, point out that the basis on which rents were calculated was 15 years for 700 cu.ft. and eight years for other meters. Industrial and non-domestic meters of 700 cu.ft. per hour capacity and above were available on cash purchase, hire purchase, or hire terms. The cash price charged for these meters is the manufacturer's price, plus 5% to cover handling and storage, plus net stamping fees. The on-costs were kept low to induce consumers to buy rather than hire. If the large industrial and non-domestic meters were put out on low hire charges, the capital expenditure incurred by the Board would be considerable. If there were a trade recession, the Board would risk having hire agreements terminated and having a large amount of capital lying idle, in addition to costs of disconnection and warehousing.

During discussion it was stated the life of a meter, on which opinions differed, extended from 15 to 30 years. It was suggested that rents should be examined, and that they should be based on a reducing rental on a stipulated time.

Walsall to Supply Lichfield With Gas as Century-old Works Closes

From February or March, Walsall gasworks is to supply Lichfield with gas, as part of its big expansion scheme. Lichfield, whose century-old undertaking is worn out and will be closed down by that time, will receive its entire supply from the new plant at Walsall.

Within two years, when the Walsall extension plan is expected to be completed, Walsall will also supply some gas to Birmingham, and some to Wolverhampton and Dudley. Output of the plant, which is now in the region of 6,000,000 cu.ft. a day, is increasing continually, eventually reaching 20,000,000 cu.ft. a day, which will more than treble its present output.

Not only will the new plant be more efficient but will be one of the most modern in the country, becoming a key production centre in the Midlands. The old Lichfield gas-producing plant, of obsolete design, will be dismantled, leaving only the twin holders for storage purposes. A distribution and service centre will, however, be maintained.

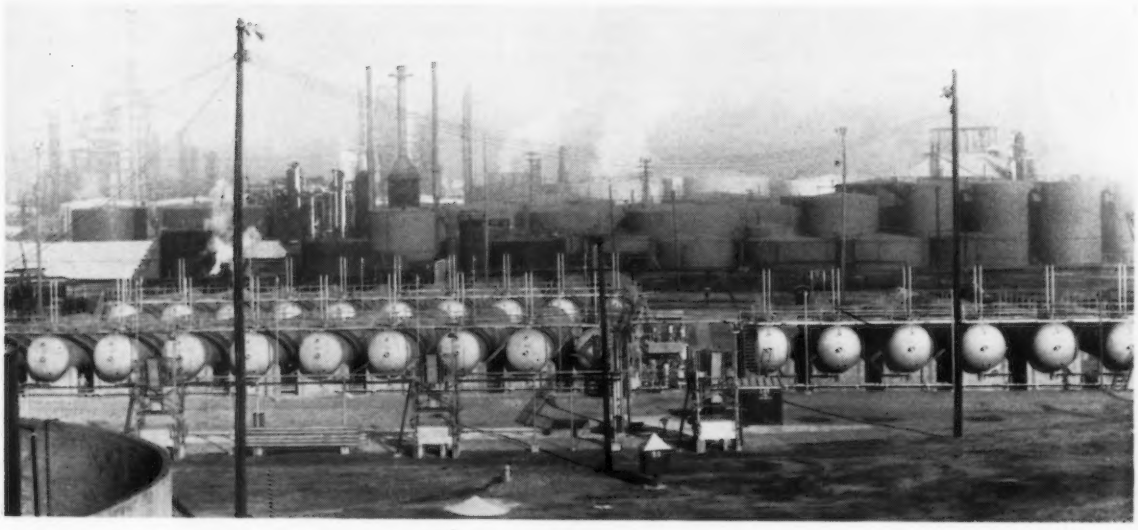
Mr. Frank Harvey, Divisional General Manager of the West Midlands Gas Board, said that it had been decided to continue production at Lichfield during the winter so as to get over the main load that was drawn from the undertaking at that time. A pipeline about 10 miles long connecting Lichfield with Walsall has been completed during the summer which will carry 500,000 cu.ft. a day to Lichfield, supplying other places en route such as Aldridge, which will have an improved supply, Upper Stonnall and Brownhills.

Mr. Harvey said the cost of replacing the old plant at Lichfield would be in the region of £200,000. It would be much more economical to transport gas from the big efficient gasworks at Walsall, than to spend such a large sum on replacements. Asked if this economy would have any effect on the price of gas in the area, he said it would not. He agreed that it was cheaper to produce on a large scale, but no change in price in the area eventually to be supplied by Walsall, was contemplated.

The rateable value of the Southern Gas Board's works at Thame, Oxon, has increased from £60 to £192.

PHILADELPHIA GASWORKS

Gas distributed by Philadelphia Gasworks has shown a remarkable growth since 1948 when natural gas was first made available. In 1947-48 the amount of gas distributed (on the basis of 720 B.Th.U. per cu. ft.) was 20,250 mill. cu. ft. The corresponding figure for 1954-55 was 45,120 mill.. cu. ft. The gas supplied is a mixture of natural gas, reformed natural gas, carburetted water gas, oil gas and coke oven gas.



Liquid petroleum storage and unloading stations.

a description of one of its stations

THERE are two Stations, A and B, one acting as standby during the summer months. The following is a description of Station A, which was visited by the delegates of the International Gas Union in September last year. The technique developed by Philadelphia Gasworks is of outstanding interest.

Today, Station A of Philadelphia Gasworks (Division of the United Gas Improvement Company) is capable of supplying about 200 mill. cu.ft. of gas per day on peak winter days—approximately half of Philadelphia's gas consumption on such a peak day.

Resurgence of Station A occurred when natural gas was introduced into Philadelphia in 1948. During 1947, prior to the advent of natural gas, the final mixed gas consisted of carburetted water gas and relatively small amounts of coal gas and purchased coke oven gas. The total year's send-out was about 15,000 mill. cu.ft. at 530 B.Th.U., requiring the use of about 49½ mill. gal. of oil, 91,000 tons of coke, and about 2,500 mill. cu.ft. of coke oven gas.

The peak day send-out was 84½ mill. cu.ft. of 530 B.Th.U. gas, with a maximum hour of 4¼ mill. cu.ft. Gas transmission equipment available for this load consisted of seven compressors totalling approximately 5,000 h.p.

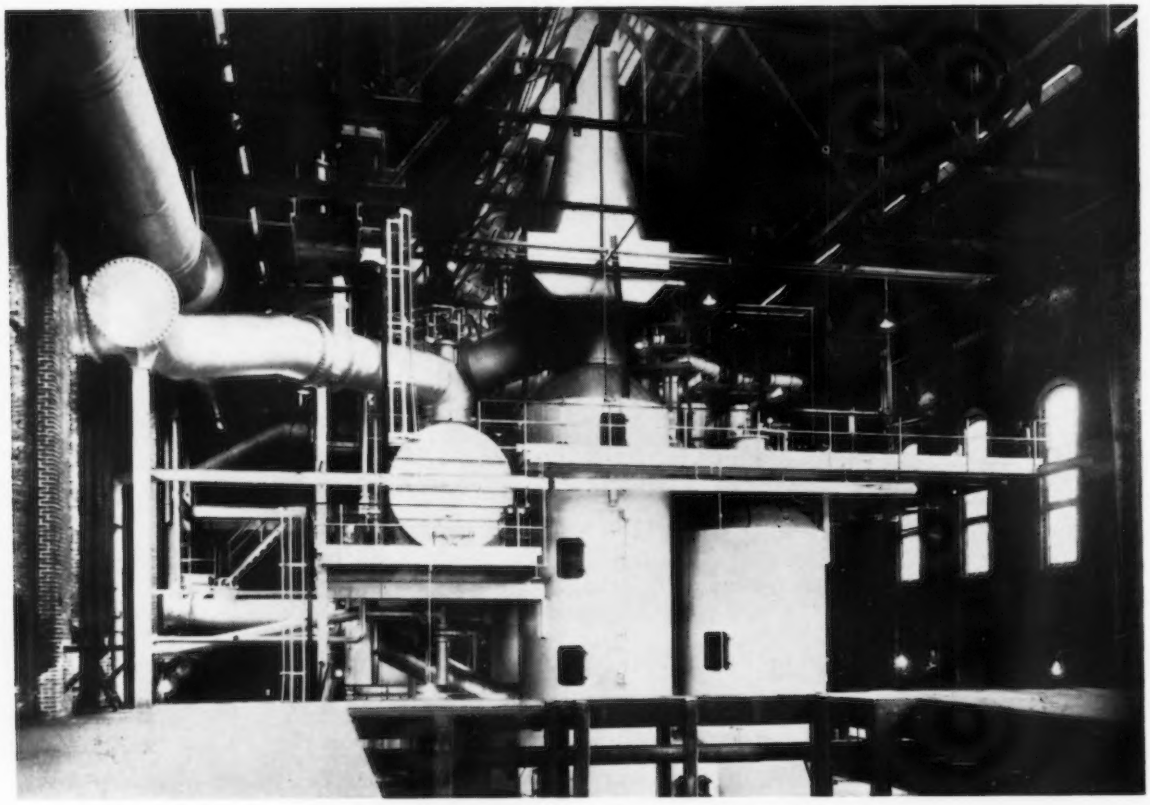
Contrast these statistics with 1955 when the send-out was about 15,000 mill. cu.ft. of 720 B.Th.U. gas, the equivalent of 21,000 mill. cu.ft. at 530 B.Th.U. This required only 2½ mill. gal. of oil, 2,500 tons of coke, and about 1,000 mill. cu.ft. of purchased coke oven gas, since about 9,500 mill. cu.ft. of natural gas was used.

In 1955, the peak day send-out was 164 mill. cu.ft. of 720 B.Th.U. gas with a maximum hour of 8 mill. cu.ft. Additional gas transmission equipment has been installed to meet this great increase in send-out. Compressor installations today total approximately 12,800 h.p., more than twice that of 1947. Six gas-engine driven reciprocating compressors totalling 7,320 h.p. were installed, including the recent addition of a 2,000 h.p. unit. New equipment also includes a 1,775 h.p. compressor driven by a 600 lb. per sq. in. steam turbine.

The send-out for 1955 has further significance in that the plant was only operated for eight months. Operating economies are obtained by maintaining one of the two Philadelphia plants in standby status during the summer.

When natural gas was first introduced, eight hand clinkered and the three mechanical generator water gas sets were modified so that natural gas could be reformed by the fuel bed process. The base load mixture then consisted of fuel bed reformed gas, together with purchased coke oven gas and natural gas enrichment. Load requirements beyond this were met with carburetted water gas. This naturally resulted in substantial savings principally due to reduced production of carburetted water gas and the attendant reduction of oil and coke usage.

In 1949 United engineers and the con-



Four-shell Hall oil gas set at Station 'A' of the Philadelphia gasworks'

structors converted one hand-clinkered set to a UGI single-shell cyclic catalytic natural gas reforming set. This was the first cyclic catalytic reforming set ever constructed and it was on this set that many present-day techniques of the process were developed. Two years later, a new two-shell set was constructed to use the cyclic catalytic reforming principle. This has substantially greater capacity and improved operating features.

In the early stages it produced approximately 14 mill. cu.ft. of 250 B.Th.U. gas per day. Improvements in the process were made and it now produces about 23 mill. cu.ft. of 250 B.Th.U. gas per day.

The capacity of these two catalytic reforming sets practically ended the use of the fuel bed reforming process. Fuel bed reforming now is used only if full catalytic reforming capacity is unavailable. The gas produced with the two catalytic sets, combined with air-natural gas and natural gas enrichment, total approximately 109 mill. cu.ft. at 720 B.Th.U. This mixture would consist of approximately:—

Catalytic reformed gas	37 mill. cu. ft. at	280 B.Th.U.
Air-natural gas	22 mill. cu. ft. at	720 B.Th.U.
Natural gas enrichment	50 mill. cu. ft. at	1,040 B.Th.U.
Total	109 mill. cu. ft. at	720 B.Th.U.

The total gas produced is substantially greater with the addition of purchased coke oven gas. The proper mixture of coke oven gas, air-natural gas and natural gas enrichment is, in itself, an interchangeable mixture. When two catalytic sets are operated and 2,000 mill. cu.ft. of purchased coke oven gas is received, the total mixture above becomes 116½ mill. cu.ft. at 720 B.Th.U. It is increased by the following:—

Coke oven gas	2 mill. cu. ft. at	530 B.Th.U.
Air-natural gas	4.3 mill. cu. ft. at	720 B.Th.U.
Natural gas enrichment	1.2 mill. cu. ft. at	1,040 B.Th.U.
Total	7.5 mill. cu. ft. at	720 B.Th.U.

Catalytically reformed natural gas, coke oven gas, air-natural gas and natural gas enrichment represent the basic send-out mixture throughout the year. As load conditions require, the following gases are added in the order given.

Oil Gas.—The Hall, four shell high B.Th.U. set was installed in 1953. Normally, high carbon, low cost oil is used. On peak days, a more costly low carbon oil is used for maximum capacity. This set is maintained in a heated condition during months of high send-out, so that it is immediately available to meet quickly increased loads. This aso serves as a quick source of relatively high B.Th.U. gas in event of an interruption in the supply of natural gas.

Carburetted Water Gas.—For usual winter temperatures, high carbon, low cost oil is used. For exceptionally low temperatures, the most costly oil is substituted, to obtain more capacity. Varying numbers of sets are kept under fire in the winter months.

Catalytically Reformed Kerosene.—Developed in 1953, this gas is produced only on days of exceptionally low temperature, when all or substantially all of the natural gas is used as enrichment or air-natural gas, and therefore is unavailable for reforming on the catalytic sets.

Liquefied Petroleum Gases.—The liquefied petroleum gas facilities, installed in 1950, are fundamentally for insurance against a serious natural gas interruption. Storage capacity is sufficient to meet the load on a 3° day without natural gas. These facilities are also used to a limited extent for peak shaving.

Before liquefied petroleum gas was available, numerous carburetted water gas sets were fully heated and ready, in winter months, to produce a gas of substantial thermal value. The ease and speed with which the LP plant can be activated now provides a method of enriching low B.Th.U. water gas produced under starting conditions.

The order shown here may vary to meet a particular situation, but, basically, economics dictate this order. The following tabulation shows the constituent gases in the mixture distributed on the peak day of 1955:—

	1,000 cu. ft.	%	B.Th.U.	Sp. Gr.
Carburetted water gas	34,500	21.2	610	0.675
Oil gas	3,302	2.0	1,101	0.980
Cyclic catalytic reformed natural gas	19,031	11.7	244	0.640
Cyclic catalytic reformed kerosene	2,150	1.3	320	0.490
Fuel bed reformed natural gas	2,401	1.5	540	0.600
Natural gas-air	35,075	21.6	678	0.720
Natural gas cold enrichment	53,591	32.9	1,042	0.603
Coke oven gas	11,719	7.2	533	0.407
Butane cold enrichment	965	0.6	3,190	2.000
Total gas metered	162,734		729	0.648

While the greatest savings were realized in the use of natural gas in manufacturing processes, its use for boiler fuel and as fuel for gas engine-driven compressors made possible further operating economy.

With a send-out of 15,000 mill. cu.ft. in 1947, the cost of steam production was approximately $1,400,000. In 1955, with a send-out the equivalent of over 21,000 mill. cu.ft. of 530 B.Th.U. gas, the cost of steam production was approximately $335,000. Some of this saving was due to the use of the lower-cost natural gas as fuel, but principal savings were accomplished by the new gas processes, new and more economical equipment, and general improvement in plant controls. In 1947, for every 1,000 cu.ft. of gas produced, 108 lb. of steam was required. In 1955, this ratio was reduced to 31 lb. of steam per 1,000 cu.ft. of gas produced on an equivalent 530 B.Th.U. basis.

Station A now employs 350 persons. In 1947, this figure ran as high as 560. Some of this reduction can be directly tied in with the substantial decrease of maintenance work required. The reduction in personnel is more significant when it is realized that employees not utilized in gas-making have been assigned to the substantial construction programme during the past few years. The period before natural gas involved little of this. Reduction in personnel occurred essentially through transfers, retirements, retraining for other work and curtailment of employing for replacement.

The vastly increased loads experienced over the past seven years were met principally, for economic reasons, by:—

1. Natural gas increases.
2. Improvement in processing techniques.
3. Reduction of hydrogen-inerts ratio from 1.2 to 0.8.
4. Increased heating value of send-out gas from 530 to 720 B.Th.U.
5. Additional equipment.

Gas Manufacture

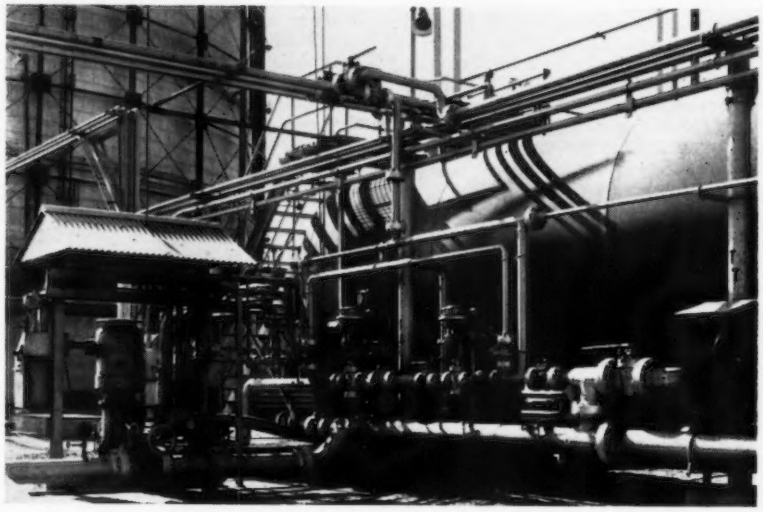
No. 1 Generator House contains 16 sets: 15 hand clinkered carburetted water gas sets and one single-shell cyclic catalytic set for reforming natural gas.

No. 2 Generator House contains five sets: three mechanical generator carburetted water gas sets; one two-shell cyclic cataltyic natural gas or kerosene reforming set; and one four-shell Hall high B.Th.U. oil gas set.

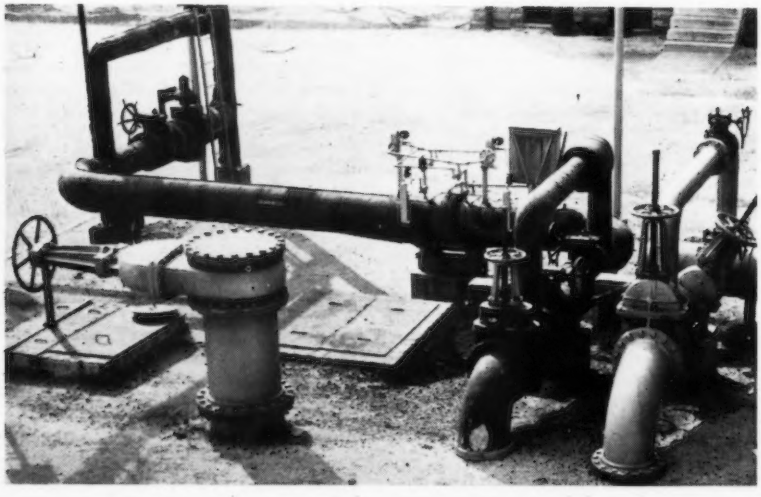
Oil System.—All carburetted water gas sets are equipped for operation with the UGI heavy oil process. Oil is pumped from storage tanks to No. 1 Generator House where heat exchangers increase the temperature to 250°F. It is piped into the Generator Houses at approximately 70 lb. per sq. in. Booster pumps installed in both houses supply the oil to the water gas and oil gas sets at 250 lb. per sq. in.

Transmission and Distribution

City gas is sent out from Station A through two segregated transmission piping systems. On peak days, gas is pumped to the northern section of the city at pressures up to 30 lb. per sq. in., and to the southern areas at pressures up to 10 lb. per sq. in. At times of small gas send-out, as little as 4 lb. per sq. in. is required on both systems and they are then combined.



A section of the L.P. liquid pumping plant

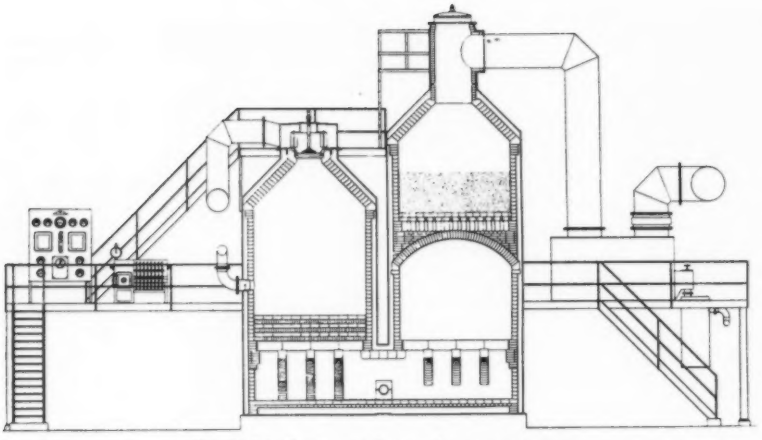


Liquid petroleum vapour enriching equipment

Gas is also delivered directly to the distribution piping system serving customers adjacent to the Station at approximately 5 in. W.G.

The transmission pumping equipment includes both gas-engine driven reciprocating compressors and steam turbine driven centrifugal compressors. The gas-engine units are designed to operate at pressures up to 50 lb. per sq. in. and the centrifugal machines are rated at lower pressures.

The gas engine compressors operate on either natural gas or city gas fuel. Their capacity is slightly higher with natural gas fuel on which they normally operate. The gas engines have a closed cooling system using city water. Heat exchangers provide for cooling of the city water with Schuylkill River water. The coolers may be supplied with water



The U.G.I. Cyclic catalytic reforming apparatus

circulated from the tank of a water seal storage holder by a separate pumping system.

One of the steam turbine compressors is driven by a 600 lb. per sq. in. 700°F. turbine exhausting at 125 lb. per sq. in. This machine is the base load unit and operates about nine months of the year. Steam exhausted from this unit is available for driving other prime movers. All other turbine compressors utilize 120 lb. per sq. in. steam and exhaust to barometric condensers.

Two governors are available for maintaining pressure on the distribution system. One of these takes gas from the transmission system at the outlet of the compressors. The other, generally used on days of maximum send-out, takes gas directly from the storage holder outlet piping. When using the latter governor on peak days, pressure is increased above storage holder pressure by two centrifugal blowers which have a combined capacity of approximately 1.1 mill. cu.ft. per hour at operating pressure.

Gas Mixing

Near the end of the gas train equipment is installed to blend the gases manufactured, processed and purchased, and to control the heating value of this mixed gas at the inlet to storage holders.

All gases are admitted to a common underground tube for mixing. This tube, although straight and continuous, is constructed in two sections. The first section is 42 in. in diameter and approximately 80 ft. long. The second section enlarges to 72 in. in diameter and extends for an additional 180 ft.

Butane-air gas is admitted at the beginning of the 42-in. tube. Manufactured gas is discharged from the station meters into the remainder of the 42-in. section and into the beginning of the 72-in. section. Purchased coke oven gas is then admitted adjacent to the manufactured gas. Next are two adjacent connections for natural gas cold enrichment and an additional connection for butane cold enrichment. The final gas admitted is the mixture of natural gas and air. This is followed by approximately 100 ft. of 72-in. mixing tube. At the far end are connections to storage holders.

Cold Enrichment Equipment.—Heating value of the mixed gas is controlled by continually measuring the B.Th.U. of the sample at the end of the tube on a Thomas calorimeter. This calorimeter supervises a 'calorimixer.' The 'calorimixer,' in turn, controls one of two motorized butterfly valves in the natural gas cold enrichment piping adjacent to the mixing tube.

The 'calorimixer' is a precise control with a quick speed of response. This equipment permits close control of the heating value to be maintained. A similar control is provided for butane cold enrichment.

The natural gas cold enrichment equipment also includes the necessary pressure reducing regulators and orifice meters to measure the gas used. The capacity of this equipment is at the moment 3.4 mill. cu.ft. per hour.

Natural Gas-Air Equipment.—A natural gas jet plant aspirates atmospheric air and mixes it into a permanent gas. These units operate with a nozzle pressure of 25 lb. per sq. in. natural gas. There are eight jets. The sizes and capacities at 720 B.Th.U. are as follows:—

No. of Jets	Jet size in.	Capacity cu. ft. per hr.
1	4	31,000
1	5	62,000
2	8	248,000
4	10	992,000
		Total 1,333,000

A similar plant is provided for butane-air mixtures.

Control of Flame Characteristics

A technique for the control of flame characteristics was developed during the change-over from straight manufactured gas to mixtures of manufactured and natural gas. This control is used to supply a gas with proper burning characteristics.

Control burners have been developed which, in effect, continuously scan the chemical and the physical properties of the gas going to the holders. When any gas deviates, even moderately, from prescribed standards, it is corrected and even the small amount produced is isolated in one holder and later blended with other gases to ensure normal operation of customers' equipment.

Flame Height Burner indicates the relationship of B.Th.U. and specific gravity and the relationship of fast and slow burning consituents. The control of the height of the flame on this burner results in maintaining nearly constant input to customers' burners. The bunsen-type flame height burner is calibrated to give a normal flame on a synthetic gas mixture. Burners now in use are operated between 2½ in. and 3 in. intercone height.

Hydrogen to Inert Ratio Burners.—Five burners are set up to indicate the relationship of hydrogen and inert constituents in the holder inlet gas. The set-up consists of five identical star burners mounted on a common manifold. Each burner is set for the same gas input by using fixed orifices. The burners are adjusted on synthetic gases with hydrogen to inert ratios of 0.6, 0.7, 0.8, 0.9 and 1.0. Air shutters are adjusted so that the flames just begin to lift or blow on the particular ratio gas.

Gas Conditioning

After leaving the generator houses, manufactured gas is passed through a group of eight vertical water-tube gas condensers to remove water, tar and oil vapours, as well as heat, and to condition it for the efficient extraction of remaining impurities. Six condensers have capacities of 420,000 cu.ft. per hour each and two have capacities of 840,000 cu.ft. per hour with 40°F. cooling water.

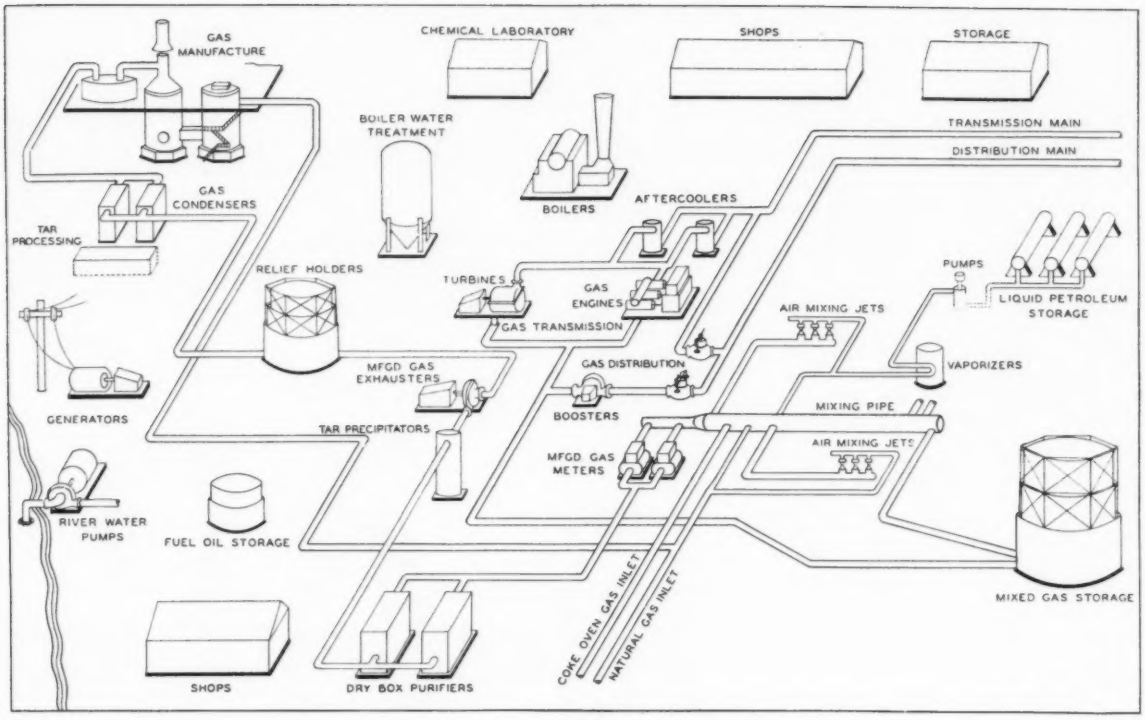
Adjacent to the condensers are two vertical tower scrubbers in which the gas ascends against a descending flow of scrubbing oil. These are available for use in removing light oils and naphthalene vapours and are used principally for fuel bed reformed natural gas. They are arranged so that they may be used on oil gas if necessary.

All gases leaving the exhausters are passed through a group of six Cottrell electrical precipitators operating at 220 V. to remove tar, and all gases produced pass through a series of boxes filled with a mixture of iron oxide and wood shavings to remove hydrogen sulphide. Eleven purification streams are available.

Humidification has been found most effective in dust control. It takes place mostly in the plant. Occasionally, this operation is done in outlying areas by portable steaming apparatus. Oil fogging has not been used.

The gases sent out are under continuous surveillance for determination of entrained particles, whether solid or oil. The apparatus used to observe particle content are: Glass impingement slides; Tyndall beams; microbalance and Arthur D. Little filters; and thermal pilots.

Control Limits.—Hydrogen sulphide: A 5% lead acetate paper exposed to the gas for one minute is not to show a discoloration. Total sulphur: The maximum permitted is 30 grains per 100 cu.ft. The usual amount is about two grains. Ammonia: The maximum permitted is five grains per 100 cu.ft. The send-out gas is consistently far below this. Naphthalene: Normally maintained below one grain per 100 cu.ft. Cyanogen: Usually runs about 0.01 grain per 100



Layout of Station 'A' Philadelphia Gasworks

cu.ft. Nitric oxide: Normally maintained below one gramme per mill. cu.ft. This is determined continuously by nitric oxide analyzers and the results are recorded.

Liquefied Petroleum

The liquefied petroleum gas plant was installed principally to cope with possible interruptions in the supply of natural gas. It is used also to a limited extent for peak shaving on the coldest days. Liquid butane and propane are used as cold enrichment gases for manufactured gas or may be blended with air before mixing with other gases. Butane is principally used at this plant.

Storage.—The tank farm consists of 26 horizontal, 30,000 gal. (water capacity) storage tanks. Each tank is 67 ft. long, has an outside diameter of 9 ft. and is designed for a maximum working pressure of 200 lb. per sq. in. The net storage capacity of the tank farm is 717,000 gal. of butane as compared with 689,000 gal. of propane, a gas of lower heat content. Generally, butane supplies are more readily available than are propane supplies in this area. For these reasons, butane is normally stored for gas production.

Transfer Facilities.—The tank farm has facilities to unload tank trucks or railroad tank cars. Transfer of liquid from cars or trucks is accomplished by differential vapour pressure developed by vapour compressors. Transfer of liquid from the storage tanks to the points of vaporization and utilization is accomplished by the use of three motor-driven pumps of the deep well type. Propane, of higher vapour pressure, is stored in two tanks. Vapour from these may be admitted to the butane tanks on cold days to increase the pressure in the butane tanks and thereby improve the suction head at the liquid transfer pumps.

Safety equipment includes line type hydrostatic valves set at 375 lb. per sq. in. These prevent excessive pressure in piping due to high ambient temperatures. All tank connections and transfer lines are protected by excess flow valves. These valves close when the flow exceeds the design rate as could occur with a rupture in the piping.

Transfer Capacities.—The unloading facilities can transfer approximately 125,000 gal. daily from trucks or cars. The three liquid pumps can each transfer 21,000 gal. per hour from the storage tanks to the vaporizers at 170 lb. per sq. in.

Vaporizers.—There are two vaporizer buildings each housing two units. Each vaporizer is of the vertical, steam-heated type and has a capacity of 10,000 gal. per hour. They are designed to produce super-heated vapour at a working pressure of 90 lb. per sq. in. All are equipped with automatic control equipment.

Propane and/or Butane Air-Equipment.—A jet plant, similar to that installed for natural gas, aspirates atmospheric air and mixes it with propane or butane. These jets which operate with a nozzle pressure of 70 lb. per sq. in., discharge the gas and air mixture to the mixing tube.

CAPACITIES

No. of Jets	Jet size in.	Capacity (650 B.Th.U.) cu. ft./hr.
1	6	75,000
1	8	150,000
1	12	300,000
2	16	1,200,000
Ttls. 5		1,725,000

Cold Enrichment Equipment.—A calorimixer, operating a motorized butterfly valve and supervised by a Thomas calorimeter, controls the admission of superheated propane or butane vapour to the mixing tube. This is similar to the natural gas equipment. Its capacity is 655,000 cu.ft. of butane per hour.

Steam Generation

Steam is generated by fuel fired boilers at 625 lb. per sq. in. and at 120 lb. per sq. in. for use mainly by prime movers. Exhaust steam at 5 lb. per sq. in. is used for gas manufacturing processes, fuel and building heating, and to a limited extent for the operation of prime movers.

Four waste heat boilers on various types of gas manufacturing sets can generate up to approximately 55,000 lb. per hour of steam at 120 lb. per sq. in. Water jackets on three mechanical grate gas sets generate a total of approximately 12,000 lb. per hour at 5 lb. per sq. in. when these sets are in service.

Constructed in 1950, the 625 lb. per sq. in. boiler incorporates forced and induced draught fans and is operated by automatic combustion controls. It has an automatic de-superheating station to provide steam at 120 lb. per sq. in.

Two prime movers operate on 625 lb. per sq. in. steam and exhaust at 120 lb. per sq. in. One of these is a 1,775 h.p. gas compressor and the other a 680 h.p. gas exhauster. The 625 lb. per sq. in. boiler is in service for eleven months of the year, and the prime movers for about nine months.

The steam load varies greatly from winter to summer, according to the gas load, and falls as low as 19,000 lb. per hour in the summer. The amount of

process steam required at 5 lb. per sq. in. varies widely. Prime movers designed for various steam inlet and exhaust conditions are available.

With the exception of the oldest units, which are operated only on the coldest days, the boilers can be fired with natural gas or oil. Natural gas is fired at times of reduced gas send-out when the quantity of natural gas available exceeds the amount needed for gas production.

The boiler feedwater is 100% make-up from the Schuylkill River. It is treated in a two-stage hot process softener, having a capacity of 60,000 gal. per hour. When gas is being manufactured, raw water is obtained from the primary gas condenser effluent at elevated temperatures. Caustic soda, lime and phosphate are employed in the water treatment process. The sedimentation tank has integral deaerating equipment. Treated water is passed through anthracite filters. The treating system, operated under the guidance of the chemical laboratory, is controlled by panel-mounted dials and instruments.

Analyses of Products

Above right is a table showing typical analyses of the natural gas utilized, the gases manufactured and the commercial gas distributed.

Tar produced in the plant is sold principally for road building material. Certain specifications must be met and, for this reason, analyses are made for operational control. Sample analysis:—

Water	1.0%
Specific gravity at 25° C.	1,214
Insoluble in CS_2	13.1%
Float test at 50° C.	60 sec.

Sulphonation Test

Oil to 300° C.	5.2%
300° C. to Coke	4.0%
Oil to coke	4.5%

	Manufactured gases			Purchased gases		Commercial gas
	Cyclic catalytic reformed natural gas	Carburetted water gas	Oil gas	Natural gas	Coke oven gas	
Illuminants	0.0	11.7	25.2	0.0	2.8	2.3
CO	9.9	22.7	1.1	0.0	6.8	6.0
H_2	40.1	34.7	14.1	0.0	51.0	16.1
CH_4	11.3	17.7	25.7	91.3	27.2	41.6
C_2H_4	0.0	0.0	3.3	3.5	0.0	9.9
C_2H_6	0.0	0.0	0.2	0.0	0.0	0.0
C_3H_{10}	0.0	0.0	0.3	2.3	0.0	0.0
C_5H_{12}	0.0	0.0	0.1	0.0	0.0	0.0
CO_2	6.3	3.9	3.0	1.0	1.4	2.1
O_2	0.2	0.7	2.4	0.2	1.0	2.4
N_2	32.2	8.6	24.6	1.7	9.8	19.6
Calculated B.Th.U.	277	627	903	1,054	526	722
Calculated sp. gr.	0.598	0.620	0.821	0.617	0.410	0.678

Typical analyses of the oil used for manufacturing are as follows:—

	No. 6 fuel oils high carbon content		High capacity oil	Diesel oil
Conradson carbon	9.95%	12.23%	0.33%	0.01%
Viscosity-Saybolt Furol	94 sec.	95 sec.	12 sec.	8 sec.
Ash	0.04%	0.08%	Trace	Trace

Coke for Water Gas

A typical proximate analysis of the coke purchased for the manufacture of water gas shows: Volatile matter, 2%; fixed carbon, 90%; ash, 8%. The sulphur content is normally about 0.7% in an ultimate analysis. Heating value: 13,000 B.Th.U. per lb.

POWER CONFERENCE FOR WALTZ-CITY

Happy Clash with Vienna Festival

DELEGATES to the Fifth World Power Conference and their wives will have opportunities to visit places which were the scenes of inspiration for the famous Austrian composers Beethoven, Schubert, Johann Strauss, and Liszt. The Conference will take place in Vienna from June 17 to 23, 1956.

There will be conducted sightseeing tours of Vienna by motor coach, and daily visits to places of interest. The conducted tours will take visitors through the old and new parts of Vienna and the Vienna Woods.

It is expected that Vienna will be crowded with visitors from most nations, as the Conference coincides with the Vienna Festival.

There will be whole and half-day excursions to hydro-electric, power, and transformer stations, gasworks, other industrial establishments, and museums.

The theme selected for the Conference is *World Energy Resources in the Light of Recent Technical and Economic Developments.* The official languages of the Conference will be English, German, and French.

It is estimated that about 300 papers will be dealt with under the following divisions:—

(1) The present status and development of power production and utilization in individual countries.

(2) The preparation and conversion of fuels.

(3) Utilization of primary sources of energy.

(4) Purification of waste water and exhaust gas in the production and use of energy.

(5) International co-operation in the production and use of energy.

The British National Committee of the World Power Conference has an office at 201-2, Grand Buildings, Trafalgar Square, London, W.C.2.

Proposed West Midlands Gasworks Would Clash With Green Belt

Three of the six grounds on which the West Midlands Gas Board has been refused planning permission for a proposed gasification plant at Coleshill, refer to the Birmingham Green Belt. The cost of the plant has been put at £4,500,000.

The County planning authority says that as the site is in the green belt the proposal would be directly contrary to the advice given by the Minister of Housing and Local Government, that every effort should be made to prevent industrial development in a green belt. It would also prejudice the local planning authority's aim to establish a green belt.

An official of the Gas Board said that an appeal against the decision of the planning authority would be considered when the position had been fully reviewed.

In anticipation of an appeal, Meriden Rural District Council, which opposed the project, has notified six parish councils in the area so that they can be represented at any local enquiry into the scheme.

Co. Down Staff Thanked

Not-so-happy Christmas

Mr. J. Collins, Manager of the Newry (Co. Down) Urban Council's gas undertaking and his staff were complimented at a meeting of the Council for their splendid work in repairing a broken gas main just before Christmas Day.

A heavily-laden lorry sank into a recently opened trench and fractured the main. The Gas Manager and his staff worked throughout the night in pouring rain to repair the damage, which, had it not been repaired promptly, could have had serious consequences.

The 100 Glasgow meter men who stopped work on January 4 in protest against the introduction of a new system, resumed their duties on January 9—under the same conditions as prevailed the week before.

W-D were actively on site in 1955

25 NEW GASMAKING PLANTS

		Tons coal/day
	Aberdeen V	175
✓	Brighton III	406
	Cambridge III	214
	Christchurch, N.Z.	150
✓	Croydon IV	270
✓	Derby III	380
✓	Dover I	341
	Dover II	341
	East Cowes	245
✓	Edinburgh IV	259
	Edinburgh V	259
	Exeter	377
	Gainsborough III	18
	Glasgow, Provan II	436
✓	Glasgow, Tradeston II	179
	Grimsby VI	80
✓	Irvine III	18
	Lancaster, White Lund	418
✓	London, Kensal Green (Complete Gasification)	50
✓	Rotherham	617
	Solihull III	50
✓	Tingley II	511
✓	Tottenham V	557
	Truro	150
	Walsall II	821

15 NEW COKING PLANTS

	Avenue, Chesterfield	2175
	Beckton IV	603
✓	Cardiff IV	963
✓	Ebbw Vale III	444
✓	Ebbw Vale IV	444
	Irlam IV	431
	Monkton II	695
	Moss Bay III	1159
	Orgreave IV	858
	Pretoria V	1089
	Pretoria VI	1089
	Ravenscraig	1608
✓	Redbourn II	353
✓	Stanton II	918
	Vanderbijl Park II	1172

✓ Completed and put to work.

The figures following the Contract names denote the number of installations built at these Works.

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- ★ Red panel Fine-Control Taps
- ★ Counter-balanced Grill door
- ★ Latchless Oven door
- ★ Easy-to-clean Oven sides
- ★ Improved Oven furniture
- ★ Handsome new Door Handles
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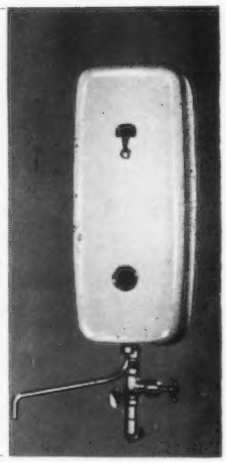

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DEMONSTRATION OF NOVEL FEATURES IN HEATING A HARLOW SCHOOL

Heat Discharged Without Ducting

A MORE suitable day could not have been selected for the recent demonstration of Radiation's warm-air system which has been installed at the Downs County Primary School, Harlow. It was foggy, and the temperature was below freezing point.

Through the co-operation of Mr. Conolly, County Architect, and Dr. Lawrence, Chief Education Officer of Essex, it was made possible for Radiation Ltd. to demonstrate the system to representatives of the Press.

The system, as applied to school heating, possesses several novel features. Twelve industrial-type gas chimney furnaces are used and the maximum flexibility, coupled with economy of operation, is claimed to have been achieved. Each of the heaters discharges straight into the rooms and corridors through grilles without any intermediate ducting. Individual thermostatic temperature control is provided in each of the eight classrooms and in the assembly hall and suite of staff rooms. A high standard of comfort with uniform temperature distribution is maintained since the warm air is discharged at low level and returned at high level.

The heating up rates are particularly rapid since, as soon as the room thermostats call for heat, warm air equivalent to the fully rated output of the heaters is discharged to the rooms. This is of special importance for school heating owing to the intermittent nature of the load and leads to economical operation.

The accompanying graphs of temperature gradients, and the graph which shows the temperature rise at the centre of the assembly hall after the system was switched on at 8 a.m., clearly demonstate the efficiency of the system and the uniform temperature distribution which can be maintained. The maximum and minimum fluctuations due to the thermostatic control are also indicated.

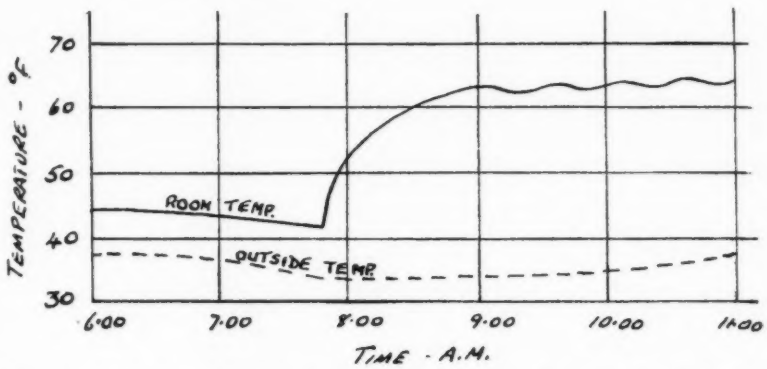
The system is simple, yet completely automatic in operation, requiring only the setting of the room thermostats to the desired temperatures. During the hours of occupancy the system switches on and off to maintain these temperatures, but during standby periods—overnight and weekends—a very small pilot flame only is maintained.

The thermostats are set to maintain temperatures that have been specified by the Ministry of Education as being the most suitable for the comfort of children, *i.e.*, 62°F. in the classrooms, 60°F. in the assembly hall, and 57°F. in the corridors. Warm air circulates through the corridors via grilles from the classroom heaters. The grilles are so designed that the lower temperature in the corridors can be maintained by the same heaters as supply the classrooms.

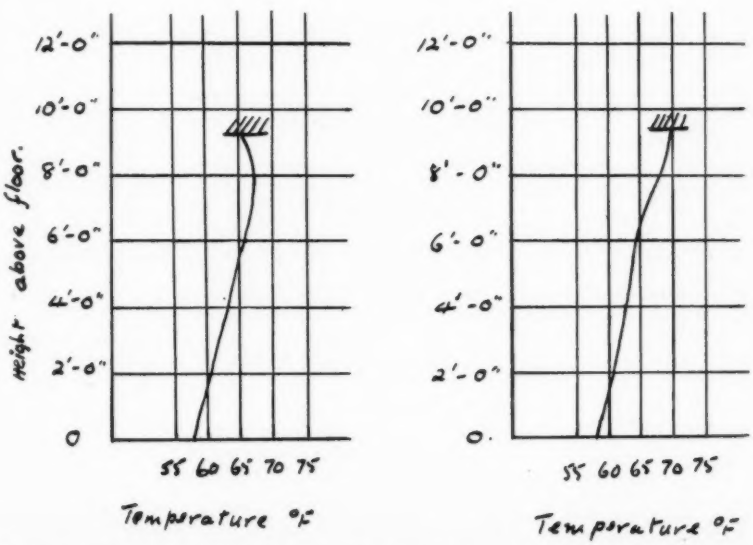
With this form of heating, a gentle air movement is given, dispelling any sense of stuffiness. Local discoloration of the decorations is also obviated, the warm air being carried across the room and away from the wall surfaces. The warm-air system cannot be considered as a form of ventilation as the heaters return the air which they withdraw. Nevertheless, there is no need for any forced ventilation when, in the winter, all windows are shut. It is claimed that the pores and gaps in the structure of the building effect a complete change of air twice an hour.

The Radiation system was first introduced for domestic use in 1948 and was then demonstrated in the 'Stanmore Experiment.' Solid fuel, gas and later oil-fired equipment were made available. In recent years the system, particularly with gas-fired heaters, has attracted special interest for the heating of shops, churches and halls. This latest installation demonstrates its suitability for schools. Each of the gas-operated furnaces consists of a gas burner chamber, a single tube heat exchanger, and an integral draught diverter which are fitted into an insulated recess, the front of which is closed off with insulated panels.

The Downs County Primary School, designed by the Essex county architect, was built by Cawood Wharton, Ltd., while the site work was carried out by Kirk & Kirk, Ltd. The school is an emergency building and was completed in 4½ months. It is entirely demountable, even including the foundation piers. Because of this mobility, and its large areas of glass, the school is poorly insulated and is therefore a particularly good subject in which to demonstrate a warm-air system. Accommodation for 320 is given and the plan is suitable for the addition of a further four classrooms increasing the capacity to 480 children.



Temperature rise at the centre of the assembly hall taken 5 ft. from the floor with the thermostat set at 60°F.



Typical examples of vertical temperature gradients taken at the centre of a classroom with the thermostat set at 62°F. Left, *with the fan off, and* right, *with the fan on.*

Manchester Juniors' Competition

The following are shortened versions of four entries for the F. Johnston Prize.
They were presented at the December 15 meeting.

TESTING GAS MAINS

By JOHN E. BROWN†

HIGH pressure mains are defined as mains in which the working pressure will exceed 10 lb. per sq. in. These mains should be tested to 50 lb. per sq. in. air or 50% above the working pressure, whichever is the greater.

There are two reasons for raising the air to this pressure:—

(a) To test the mechanical strength of the main—*i.e.*, reveal any flaws in the metal.

(b) To ensure that the anchorages of bends, plugs, caps and tees are adequate.

Before the pipes are laid a 'ringing' test should be made to ensure that they have received no splits through handling.

The main should be laid in sections for the purpose of testing, since a leak on a small section of main may be more easily detected than on a large section. It is recommended that the length of each section should not exceed 500 yards. A highly important factor to bear in mind is that an appreciable leakage on a large length of main may not be indicated adequately by the pressure readings and that such a leakage could in fact lead to disastrous results when the main is charged with gas.

Before commencing to pump up the main to the required test pressure it is important that the following procedure should be adhered to:—

(a) The trench should be sufficiently filled in and the earth rammed between the joint holes to secure the pipe in position, since any side movement of the pipes may affect the joints and lead to failure.

(b) All caps, plugs, bends and tees must be securely strutted. The strutting must not at any time foul any other services. Strutting must bear against undisturbed earth; in cases where this is not possible, the bearing surface should be extended until firm support is obtained.

(c) The standpipes, pressure recording instruments and valves should be examined before use to avoid the test having to be repeated due to failure of testing gear.

(d) All connections of indicators and/or pressure recording instruments should be situated at least 3 ft. from the edge of the trench and not to be in line of the main.

(e) Warning signs shall be suitably positioned so as to eliminate any possible dangers to the public.

(f) Valves and syphons should be inspected before insertion into the pipeline, to make sure that there are no loose or missing nuts and bolts. There have been cases where this has not been carried out with the result that the A.R.P. flange has blown off.

(g) All valves in the pipeline should be left open before the test pressure is applied and at no time should they be used as end caps because of the large forces to which they would be subject.

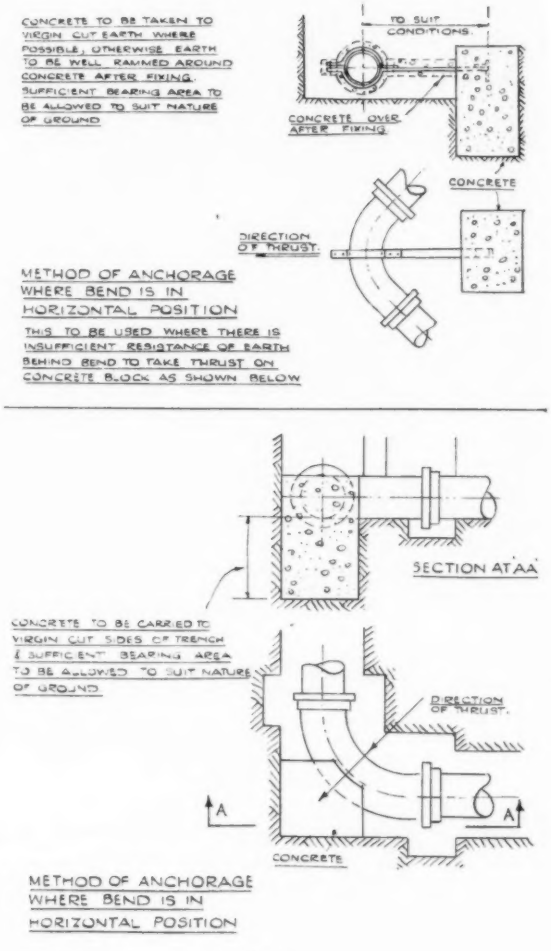
It is advisable that the caps and plugs should be marked in such a way that while the test pressure is being put on, any movement will be clearly shown. After the foregoing requirements have been fulfilled, pumping of air into the main may proceed.

Figs. 1, 2 and 3 show the type of anchorage for caps, plugs and bends, and the form of standpipe recommended.

Preliminary Testing

During the pumping-up process, each pipe and special are subject to large forces, and there is a possibility of serious fracture should small undetected cracks exist or of movement of anchorages if they have not been properly installed. In view of this:—

† Junior Technical Assistant, Distribution Department, Manchester Group, North Western Gas Board.


CONCRETE TO BE TAKEN TO VIRGIN CUT EARTH WHERE POSSIBLE, OTHERWISE EARTH TO BE WELL RAMMED AROUND CONCRETE AFTER FIXING. SUFFICIENT BEARING AREA TO BE ALLOWED TO SUIT NATURE OF GROUND
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METHOD OF ANCHORAGE WHERE BEND IS IN HORIZONTAL POSITION
THIS TO BE USED WHERE THERE IS INSUFFICIENT RESISTANCE OF EARTH BEHIND BEND TO TAKE THRUST ON CONCRETE BLOCK AS SHOWN BELOW
SECTION AT AA
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METHOD OF ANCHORAGE WHERE BEND IS IN HORIZONTAL POSITION

Fig. 1.

(a) No men should be in the trench while pumping is being carried out.

(b) The foreman should make a periodical examination, at a distance, of all anchorages to ensure that they are 100% efficient while being subjected to the test pressure.

(c) A Bourdon pressure gauge should be fitted to the standpipe to ensure that the pressure of 50 lb. per sq. in. is not exceeded when the main is being pumped up.

After the test pressure has been built up, the jointer should test each joint with a soap solution, but he must at no time be behind a cap, plug, bend or tee, however securely these may be anchored.

When the foreman is quite satisfied that the soundness of the job has been proved, and after a lapse of not less than two hours has been allowed for the air to cool, then a section test may be applied.

S.E.G.B. Mains Pressure Tester

If the reading of the test pressure of 50 lb. per sq. in. were taken on a mercury gauge, difficulties would arise, and if a Bourdon pressure gauge were used the accuracy would be insufficient. The best instrument to employ is the South Eastern Gas Board's combined dead-weight and oil gauge which is

manufactured by Nash & Thompson Ltd. This instrument will record pressure differences as small as 0.01 lb. per sq. in. accurately and it is recommended that this gauge should be used for the testing of high pressure mains.

Absolute pressure units must be used, since the barometric pressure change during the test may be considerable compared with the permissible pressure losses (Table 1). It is considered that a barometric pressure reading taken within a 10-mile radius of the site should be sufficiently accurate.

It may be advisable to fix a recorder in parallel with the instrument in order to detect any interference during the course of the test.

The permissible pressure losses in Table 1 neglect the effects of temperature, and for large temperature changes observed on a thermometer at the site, it is advisable to make the necessary corrections.

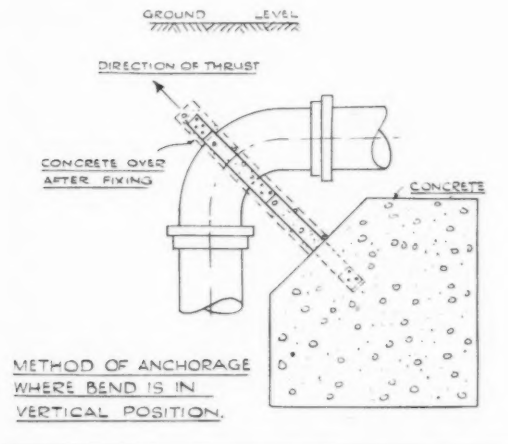
Low Pressure Mains

Low pressure mains are defined as mains intended for working pressures up to 12 in. w.g. The recommended test pressure, with air, is 10 in. mercury gauge.

In low pressure testing we are dealing with comparatively small forces; hence the anchorages are limited to only two cases. It is advisable to construct a simple anchorage for the caps and plugs. The small forces on the bends may be anchored simply by filling-in and ramming in such a way so as to counteract the small forces present. The trench should be sufficiently filled-in and rammed between joint holes.

The test pressure may be applied by using a hand pump. A mercury gauge should be fitted to the standpipe so as to allow a periodical check to be made until the test pressure is reached. With the test pressure applied, the same procedure should be adopted as explained in the high pressure testing.

A single limb mercury gauge reading up to 12 in. and suitable for reading to $\frac{1}{10}$ in. should be used.



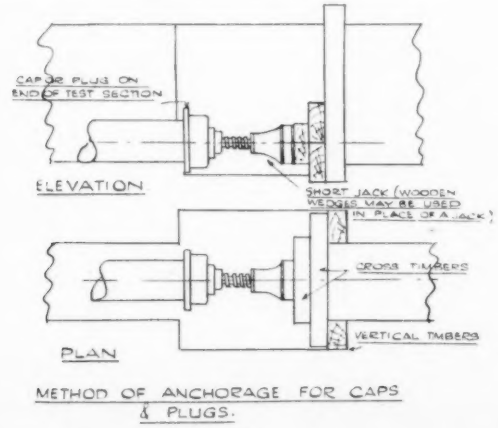
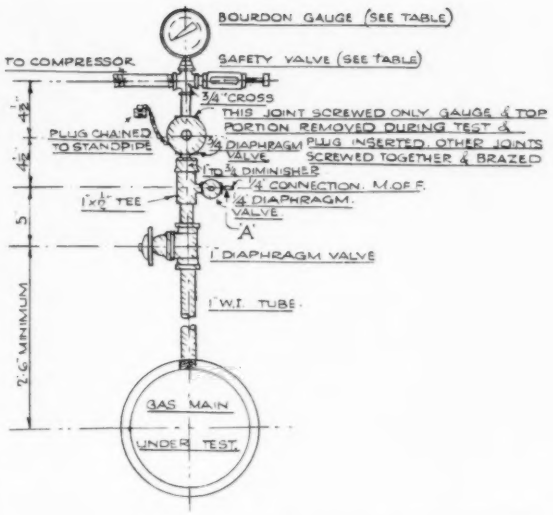

CAP OR PLUG ON END OF TEST SECTION
ELEVATION
SHORT JACK (WOODEN WEDGES MAY BE USED IN PLACE OF A JACK)
CROSS TIMBERS
VERTICAL TIMBERS
PLAN
METHOD OF ANCHORAGE FOR CAPS & PLUGS.

Fig. 2.



TYPE OF MAIN	TEST PRESSURE LBS/SQ.IN	SAFETY VALVE SET AT LBS/SQ.IN.	SAFETY VALVE TO BE COLOURED	BOURDON GAUGE TO READ LBS/SQ IN
LOW PRESSURE	5	6	GREEN	10
MEDIUM PRESSURE	20	22	AMBER	30
HIGH PRESSURE.	50	55.	RED	80

Fig. 3.

For testing mains up to 12 in. diameter, an overnight test from 5 p.m. until 9 a.m. the following morning is quite satisfactory. For mains larger than 12 in. diameter the mercury gauge should be modified to read to 1/100 in. and a 24-hour test must be applied.

It may be advisable to fix a recorder in order to detect any interference during the course of the test.

TABLE 1.—PERMISSIBLE PRESSURE LOSSES

Class of main	Low pressure		Medium pressure	High pressure
Test pressure	10 in. Hg		20 lb./sq. in.	50 lb./sq. in.
Duration of test	24 hr.	16 hr.	24 hr.	24 hr.
Size of main, in.	in. Hg	in. Hg	lb./sq. in.	lb./sq. in.
4	0.3	0.20	0.6	0.8
6	0.2	0.15	0.4	0.5
8	0.15	0.10	0.3	0.4
12	0.15	0.10	0.25	0.3
18	0.11	—	0.2	0.2
24	0.08	—	0.15	0.1

These permissible pressure losses are derived on the assumption that the temperature is constant and that the rate of leakage is proportioned to the surface area of the pipe.

Location of Leakage

In the event of the difference in pressure readings in the main being outside the tolerance limits, attention must be directed to the location of the leakage of air.

It is recommended that a repeat of the soapy solution test should be made, with a thorough examination of all joints, especially those carrying the standpipe, and the caps and plugs. A mirror will be found useful for examination underneath the joints.

If no results are obtained, then either one or other of the following methods should be applied.

(a) Insertion of Ethyl Mercaptan

It is necessary first to relieve the test pressure. For this operation it is desirable that the public residing near to, or passing, the standpipe, should be warned.

Ethyl mercaptan may be obtained in glass tubes and is inserted via the standpipe. A hole is drilled and tapped at the far end of the main to allow diffusion of the ethyl mercaptan and the air when re-pumping up to test pressure. Each pipe and joint should then be carefully examined for the

odour, which is easily recognizable. The amount of ethyl mercaptan may be determined by the fact that an eggcupful is sufficient to odorize, 3,240 cu.ft. of air or ½ mile of 15 in. diameter main.

(b) Halogen Testing Apparatus

The procedure is adopted as in (a) but carbon tetrachloride is used instead of ethyl mercaptan. An electrical instrument is employed instead of a sense of smell, to detect the fumes escaping.

If these methods yield no results, the main should be divided into two sections and each section should be tested separately. The results obtained for each test will indicate where the trouble lies, and will diminish the length to be searched. The same procedure should then be used as explained previously in (a) or (b) above.

Conclusion

Experience proves that the most economical method of mainlaying is ensured by installing the pipe correctly and making the joints according to to the maker's specification and by frequent testing as the work progresses. Any neglect of these factors may lead to extremely high costs in locating and remedying defects.

Since the permissible pressure losses are derived by assuming that the rate of leakage is proportional to the surface area of the pipe, it is important that every joint in the pipeline should be tested by soap solution.

Where a main is laid in a busy thoroughfare, it is often necessary to fill-in after each pipe is laid. In this case it is important that the air test should be applied on reasonably small sections so as to eliminate the possibility of a single joint leaking and having little effect on the pressure in a great length of main.

In conclusion I should like to express my thanks to Mr. Wilson, General Manager, and to Mr. Crowle, Distribution Engineer of the Manchester Group not only for permission to present this paper but also for their encouragement in its preparation.

SUPPLEMENTARY HEATING OF CONTINUOUS VERTICALS BY COAL GAS

By E. B. PARTINGTON†

IT is in the nation's interest that as much smokeless fuel as possible should be made available to the public.

Coal gas can, of course, be used partly to displace coke as the fuel for carbonizing coal. This paper describes a trial on a small works.

The investigation was carried out at Glossop. At the Glossop gasworks is a bench of eight downward-heated Woodall-Duckham 62-in. vertical retorts. The bench operates on a base load factor, so that results from week to week are comparative.

Primary objective of the investigation was to ascertain the practicability of partial coal-gas heating and to find the limit to which coal gas could be used to displace coke as a producer fuel.

The two step-grate producers at Glossop operate on natural draught and have water cooled firebars. No blowers or venturis are fitted. The coal gas used was supplied at constant pressure from a single-lift holder and was measured by a Connersville meter. The gas was admitted to each producer 1 ft. above the lintel of the clinkering door by a single 4 in. dia. main through the brickwork. The gas flow was regulated by a quadrant valve which had previously been calibrated against the Connersville meter. The flow of gas corresponding to any position of the valve was therefore known.

The following is a summary of the data obtained from the investigation.

(1) Average weekly figures for normal operation.

(2) Results of seven days operation when adding coal gas at 1,500 cu.ft. per producer per hour—*i.e.*, approximately 19% of heat requirement of the setting.

(3) Results of 21 days operation when adding coal gas at 1,750 cu.ft. per producer per hour—*i.e.*, approximately 25% of the heat requirement of the setting. (Results are expressed on the basis of an average week to yield valid comparison with (1) and (2)).

An attempt was made to calculate the increase in price of coke that would be required to pay for the coal gas used on the setting, assuming gas at 6.5d. per therm, breeze at 30s. and coke at 80s. per ton, and also assuming that the cost of gas used on producers is spread over all coke made for sale.

In test (2) the extra revenue necessary is 48d. per ton, and in test (3) the extra revenue necessary is 22d. per ton.

† North Cheshire Group, North Western Gas Board.

Throughout the run at 1,750 cu.ft. per producer per hour the retort temperatures increased. During the test the combustion flue temperatures were averaging 1,390°C. On complete shut-down of coal gas to producers the temperatures fell to 1,300°C., and the CO dampers had to be re-opened to their original position (a movement of 3 in. in some cases).

	Total gas made	Gas used on producers	Net gas made	Coal used	Net make per ton	Coke for sale	Breeze for sale	Coke & breeze cwt. per per ton
1	cu. ft. 6,097,000 therms 27,497	cu. ft. *Nil* —	cu. ft. 6,097,000 therms 27,497	tons 313	cu. ft. 19,480 therms 87.97	tons 150	tons 19	10.78
			Average C.V. 451					
2	cu. ft. 6,021,000 therms 27,155	cu. ft. 504,000 therms 2,274	cu. ft. 5,517,000 therms 24,881	tons 302	cu. ft. 18,290 therms 82.51	tons 152	tons 19	11.37
			Average C.V. 451					
3	cu. ft. 6,156,000 therms 27,823	cu. ft. 579,000 therms 2,614	cu. ft. 5,577,000 therms 25,209	tons 315	cu. ft. 17,700 therms 80.00	tons 159	tons 27	11.75
			Average C.V. 452					

The rate of water flow affects the CO_2/CO ratio and the hydrogen content of the producer gas. No increase in water rate was necessary as a result of coal gas introduction to the producer.

On the initial test approximately 19% of the heat requirements of the setting were supplied by coal gas, and the second test was run at 25% coal-gas heating, which was a maximum for efficient heat control of the setting.

During the second test run, coal gas was admitted at approximately 1,750 cu.ft. per hour, and the test was carried out over a period of three weeks. The amount of coke for sale was greater.

The cost of coal gas heating was higher during the first run than during the second run. The throughput per retort was higher during the second run, and the coke available per retort per day was greater.

During the tests purified coal gas was used on the purifiers. Unpurified gas could have been used, but this would have required the installation of a governor and additional gas mains.

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Width (over Unions) - - - - 4¾ ins.
Depth Back to Front (Flange) 6¼ ins.

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- *Easy to Fit—Unions are to IGE standards, centre to centre, so that the 'Bantam' can be fitted to existing installations.*

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By early Edwardian times, gas lighting was almost universal. Electric light, at first as weak and unsure as the earliest gas burners, was fast becoming a keen competitor. Lower costs and greater efficiency kept gas in the lead until well into the new century. Then, as electric light conquered, gas was increasingly developed to provide heat for homes and factories. A bright future still lay ahead.

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DRYING SPENT OXIDE FOR SALE

By F. P. RICHARDSON †

THIS paper records the method adopted at Lostock Hall Works, Preston, for the drying of spent oxide for sale. The introduction of the moisture penalty by the buyers was the deciding factor that some method of drying would be an advantage, provided that this could be achieved cheaply and easily.

The reduction of the moisture content of oxide in the purifier boxes was becoming more difficult, due largely to the increased amount of water gas present, which rose from 10.7% in 1952-53 to 25% in 1954-55.

The lower hydrogen sulphide content of the water gas resulted in a reduction of the load on the purifier boxes, in spite of the increased amount of gas produced. Consequently the heat liberated from the oxide was reduced, and this led to an increase in moisture content when the spent oxide was removed from the purifier boxes.

It was reasoned that if the spent oxide could be dried externally to give a moisture content lower than 10%, there would not only be a large saving due to the elimination of the moisture penalty, but the transport charges would be lower, due to the reduction in weight by drying. There could also be an increase in the unit price of oxide if the sulphur percentage on the wet basis was raised from one price range to another. This would only apply if the original sulphur content was lower than 53%.

In considering methods of drying, the main objects were ease of handling, economy of installation and operation, and utilization of the space available in the purifier sheds.

The spreading of the spent oxide on a heated floor was ruled out, due to the cost of installation and space required.

It was thought that if the large amount of air being drawn through the disintegrator could be heated, the oxide would be dried as it was broken up on removal from the purifier boxes without any increase in handling charges. An attempt was made to heat the air passing through the machine by a radiator using exhaust steam. It was found, however, that although the air temperature rise was considerable (the final air temperature being in the region of 120°F.) the time of contact was insufficient for any appreciable drying to take place. In actual fact the moisture content was reduced by only 1% in passing through the disintegrator.

The next method tried—and the one which was finally adopted—was by passing air, heated with exhaust steam condensed in a radiator, through a triangular space formed by the wall and floor of the purifier shed and purifier grids. The grids are suitably supported by channel iron supports at 40° to the horizontal which are placed 3 ft. apart, and wooden purifier grids (3 ft. by 2 ft.) are laid across them three per section. The lower grids are held in position by small metal plates welded to the ends of the channel sections. The space between the rear wall and the top grids is sealed by a long piece of hessian, folded over and held in position by wooden spars.

A permanent brick wall 8 ft. 6 in. high and nearly 8 ft. long, at right-angles to the wall of the purifier shed, forms one end of the oxide heap. This wall has a 9-in. cast iron pipe built through to provide entry of the heated air.

Reinforced concrete 'Stelcon' sections, 3 ft. 6 in. high, are placed at varying distances of 2 ft. and 1 ft. from the base of the lower grids to form a front wall. The sections are placed 2 ft. from the grids at the air inlet end, tapering to 1 ft. from them at the other end. In this way, more even drying of the oxide is achieved. If the heap is constructed without these sections forming a front wall, a large amount of the oxide (about 25%) remains undried.

No permanent wall is built at the far end of the heap, the reinforced concrete sections being rounded off to form a stop end. In this way, varying amounts of oxide can be accommodated as required by using more or fewer of the concrete sections.

The air is provided by a gas booster, driven by a 5 h.p. electric motor. This draws in air through a gauze filter fitted with an adjustable air slide to prevent overloading the motor. The booster has a nominal output of 60,000 cu.ft. of gas per hour and actually passes between 45,000 and 50,000 cu.ft. of air per hour against a back-pressure of 4 in. WG.

The air is passed through a specially constructed radiator made from welded steel sheet. The radiator contains six rows of $\frac{3}{8}$-in. copper tubing, 2 ft. 6 in. in length, which are spiralled externally with copper wire. The copper tubes are placed in staggered formation between the header and base tanks, and provision is made so that plates can be inserted to convert the radiator from single-pass to triple-pass if required. It is found in practice that adequate heating is available without this modification.

Exhaust steam, with a maximum available pressure of 20 lb. per sq. in. is passed through the radiator. The steam pressure is adjusted to about 5 lb. per sq. in., and a pressure relief valve set at 7 lb. per sq. in. is fitted to the header tank of the radiator. (The radiator was tested to a pressure of 40 lb. per sq. in. before installation.) An exhaust head is fitted to the steam outlet, with a throttle valve to control and pass the condensed steam. With a steam pressure of 5 lb. per sq. in. and a back-pressure against the booster of 4 in. WG., the air temperature is increased from 60°F. to 205°F.

The oxide is loaded on to the grids to form the heap by a mechanical shovel. The heap is then trimmed-off by hand to the steepest angle possible. Two labourers and one mechanical shovel driver are employed on this operation. The time taken for loading 70-80 tons of spent oxide is approximately 5 hours.

The drying operation takes from one to three weeks, depending on the original moisture content of the oxide. The process is one of continual evaporation and condensation. It is considered more economical and practical to dry the oxide this way than to do so in thin layers, due to the amount of handling required with the latter method, although the steam and electricity consumptions, and time taken, would be less.

Ventilating bricks are incorporated every yard just above the top of the oxide heap to allow the water vapour to escape from the purifier shed.

When dry patches appear along the surface of the oxide the reinforced concrete sections are taken away. The oxide is then removed by mechanical shovel. This unloading operation takes approximately 4 hours.

As the wooden grids are very dry and brittle, due to the hot air, they require careful handling to avoid breakages. Metal grids would overcome this problem, but are not used since they are more costly and the wooden grids used are those discarded from the boxes.

On removal of the oxide, the average moisture content is lower than 5%, and quite a large proportion contains no moisture. The unloading operation is, therefore, rather dusty, and the men are provided with goggles and breathing masks.

When a batch of oxide is to be dried, the sulphur percentage is taken into account and calculations are made to find out the most economical moisture content desired when the oxide is sold. The amount which has been dried is mixed with the undried oxide in the correct proportions as the road wagons are loaded.

Elevation of Sulphur Percentage on Wet Basis	Increase in Price Pence per Unit
From 46-48 to 48-50	1
From 48-50 to 50-53	$\frac{1}{2}$
From 50-53 to >53	$\frac{1}{4}$

The running costs at present-day prices are as follows:—

† Junior Technical Assistant, Lostock Hall Works, North Western Gas Board.

(1) *Electricity.*—The motor consumes 9.1 units an hour. The cost, with a unit price of 1.1d. per unit, is £1 per day.

(2) *Steam.*—The unit has a steam consumption of 160 lb. per hour and the cost is taken as £1 4s. per day. This assumes that the steam is produced by a Lancashire boiler fired by breeze. In actual fact, there is usually sufficient excess exhaust steam available for the drying unit.

(3) *Labour.*—The total cost of labour for the loading and unloading operations is approximately £7.

The total cost of the process is approximately £3 per day.

	Before drying	After drying
Weight	470 tons	444 tons
Moisture	13.6%	7%
Sulphur (wet basis)	49%	52%
Price per unit	2/- (delivered)	2/0½ (delivered)
Penalty for excess moisture	37%	*Nil*
No. of sulphur units	23,100	23,100

The above figures are of a typical batch of 470 tons of spent oxide sold earlier this year of which 300 tons of the original material was dried to approximately 3% moisture and then mixed with the remaining 170 tons to give an overall average of 7%. The period required for drying was 30 days made up of four batches of 75 tons, each taking approximately 7½ days to dry.

The comparative revenue from this consignment may, therefore, be analyzed as follows:—

In Original State	£	When Processed	£
23,100 units at 2s.	2,310	23,100 units at 2s. 0½d.	2,358
Less 37% moisture penalty	855	*Less* Cost of drying	90
	1,455		2,268
Less delivery charges 470 tons at 15s.	352	*Less* delivery charges 444 tons at 15s.	333
	1,103		1,935
Net income per unit 11.46d.		Net income per unit 20.10d.	

This batch yielded a net additional income of £832 (representing 8.64d. per unit), which can be wholly attributed to the introduction of this method of processing.

The method described has eliminated any possibility of incurring loss of revenue from spent oxide due to high moisture. It has also provided a means of achieving the maximum unit price for sulphur percentage and has, therefore, undoubtedly contributed to a more economical operation of the purifiers.

DOMESTIC COKE TESTING

By BRIAN COOK †

IT is known that a relatively reactive coke is produced by carbonizing low rank coals in continuous vertical retorts with about 10% steaming. The coal should have a high content of bright coal, and crushed large coal is better than nuts or slack. The throughput of the retorts should be such that as little of the carbon of the coke as possible is converted from the amorphous to the graphitic condition—*i.e.*, exposure to severe temperature conditions should be avoided. The method of quenching should avoid the formation of breeze.

The domestic coke produced by observing the above requirements would then have the following properties:—

(1) Low bulk density.
(2) Low ash content.
(3) Moisture between 3% and 10%.
(4) Size of 1 in. to 2 in. (No. 2).

A low bulk density implies that the coke has a very open cellular structure which make for good combustibility. It also means that the carbon is amorphous rather than graphitic. Graphitic carbon is very hard and inert and needs a high temperature for its ignition, and good air supply for its continued combustion. An open cellular structure offers a larger surface to the passage of air and is therefore more reactive. The size of the coke and its packing on the fire determine the resistance the bed offers to the passage of air required for combustion. Correct screening is obviously important.

A high proportion of ash in the fuel bed tends to prevent the air coming into contact with the combustible carbon in the coke. The worst type of ash is the light fluffy variety which effectively blankets the fire.

Moisture in coke is of some importance. Too little moisture gives rise to dust; too much makes for poor combustibility and adversely affects time of ignition. About 3% should be the minimum moisture content; 10% the maximum.

The size of the coke determines largely the resistance of the fuel bed to the passage of air. The larger the coke, the more open the fuel bed, and the easier the passage of air and waste gases. On the other hand, the more open the fuel bed the greater are the voids in the bed and the less is the surface contact of the pieces of coke—a factor which influences the maintenance of combustion. A compromise is thus desirable. The coke bed must be sufficiently open to allow the free passage of air, and sufficiently tightly packed to maintain combustion. It is thought by some that the maximum size of the coke for domestic purposes should be less than 2 in., possibly as low as 1½ in. to give the best packing. It is certainly undesirable that domestic coke should contain appreciable amounts of material over 2 in. A certain amount of undersize is, however, permissible, and No. 2 coke on leaving the storage hopper should be passed over a screen that is a compromise between a debreezing screen and a guard screen. It is not desirable that any breeze formed in the hopper should be included with the domestic coke for sale or for testing.

The quality of coke supplied to the consumer should be under constant review and its free-burning characteristics and reactivity are the criteria by which the coke should be judged. A system of domestic coke grading and pricing could then be introduced with benefit to both the consumer and the supplier.

The five tests commonly applied to domestic coke at Liverpool, apart from the usual sulphur, C.V. and proximate analysis, are: bulk density, size grading, critical air blast (C.A.B.), volatile therms, and 'open fire.'

The thermal value of the volatile matter in coke is usually less than 2.5 therms per ton, and it has been found that any variation in this figure below that value has little effect on the time taken for the fire to reach an output of 5,000 B.Th.U. per hour. It may be that for figures in excess of 2.5 or 3 therms per ton the thermal value of the volatile matter will play a significant part in the reactivity of the coke. However, the average coke from continuous vertical retorts does not contain a high percentage of volatile matter, and as the thermal value of the volatile matter increases the test becomes less accurate. The 'volatile therms' test is not, therefore, considered to be of great value as giving an indication of the combustibility of vertical retort coke.

The C.A.B. test is open to three serious objections. First, the effect of coke size and moisture content is eliminated. Second, the crushing of the coke to the required size for the test destroys its porosity and cellular structure. This cellular structure largely influences the reactivity of the coke. Third, when the coke is crushed the softer and more reactive coke is crushed more easily than the harder and less reactive coke.

(*Concluded on p. 174*)

† Central Laboratory, Liverpool Group, North Western Gas Board.

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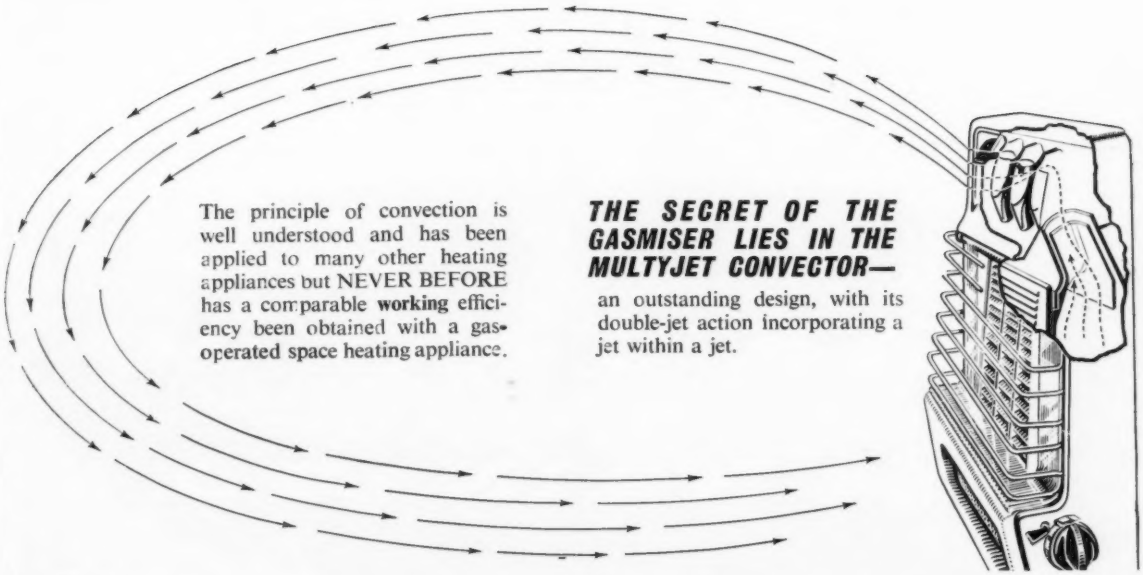

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FLASHBACK

On the Production of

Gas *for Illumination .... from* Oil

EXCEPT in the first application of prepared gas to the economical purpose of procuring artificial light, there is, perhaps nothing in that branch of applied science which holds such fair prospects as the use of oil in its formation. Without being more expensive than the gases that have already been prepared from coal, tar, and other substances, it offers every use and convenience they have; in some respects, superiorities; and it effectually prevents the undue influence of a monopolizing spirit, which would originate in the necessity of large establishments, or the difficulty and trouble of small ones.

Messrs. J. and P. Taylor are the first persons who have resorted to oil as a substance from which gas for illumination could be easily and cheaply prepared; and in the construction of a convenient apparatus for the decomposition of this body, they have fully shewn its numerous advantages over coal, while they have afforded the means of producing the most pure and brilliant flame from the inferior and cheap oils, which could not be used in lamps. The apparatus for the purpose is much smaller, much simpler, and yet equally effectual, with the best coal gas apparatus. The retort is a bent cast iron tube, which is heated red by a small convenient furnace, and into which oil is allowed to drop by a very ingenious apparatus; the oil is immediately volatilized, and the vapour in traversing the tube becomes perfectly decomposed. A mixture of inflammable gases, which contains a great proportion of olefiant gas passes off; it is washed by being passed through a vessel of water (which dissolves a little sebacic acid, and which seldom requires changing), and is then conducted into the gasometer.

The facility and cleanliness with which gas is prepared from oil in the above manner, may be conceived from the description of the process. A small furnace is lighted, and a sufficient quantity of the commonest oil is put into a small iron vessel, a cock is turned, and the gas after passing through water in the washing vessel, goes into the gasometer. The operation may be stopped by shutting off the oil, or, to a certain extent, hastened by letting it on more freely; the small quantity of charcoal deposited in the retort is drawn out by a small rake, and the water of the washer is very rarely changed.

The gas prepared from oil is very superior in quality to that from coal; it cannot possibly contain sulphuretted hydrogen, or any extraneous substance; it gives a much brighter and denser flame; and it is more effectual, *i.e.*, a lesser quantity will supply the burner with fuel. These peculiarities are occasioned, in the first place, by the absence of sulphur from oil, and then by the gas containing more carbon in solution. As the proportion of light given out by the flame of a gaseous compound of carbon and hydrogen, is in common circumstances in proportion to the quantity of carbon present, it is evident that the gas which contains a greater proportion of olefiant gas, or supercarburetted hydrogen than coal gas, will yield a better and brighter light.

It is necessary, in consequence of the abundance of charcoal in solution, to supply the gas when burning with plenty of atmospheric air, for as there is more combustible matter in a certain volume of it, than in an equal volume of coal gas, it of necessity must have more oxygen for its consumption. The consequence is, that less gas must be burnt in a flame of equal size, which will still possess superior brilliancy; that less is necessary for the same purpose of illumination; and that less heat will be occasioned. From 5½ to 6 cubical feet of coal gas are required to supply an Argand burner for an hour; 2 cubical feet to 2½ of that from oil, are abundantly sufficient for the same purpose.

One important advantage gained by the circumstances, that so small a quantity of this gas is necessary for burners is, that the gasometer required may be small in proportion. The gasometer is the most bulky part of a gas apparatus, and that least capable of concentration; and wherever it is placed, it occupies room to the exclusion of everything else. Some very ingenious attempts have been made to diminish its size and weight, as in the double gasometer, and others, but without remarkable success. Here, however, where the room required to contain the gas is directly diminished, the object is so far obtained; and when that takes place to one half, or even one-third, it is of very great importance. It in a great number of cases brings the size of the apparatus within what can be allowed in private houses; and in consequence of the rapidity with which the retort can be worked, the gasometer may again be reduced to a still smaller size.

Another advantage gained by the small quantity of gas required for a flame, is the proportionate diminution of heat arising from the lights. The quantities of heat and light produced by the combustion of inflammable gases are by no means in the same constant relation to each other; one frequently increases, while the other diminishes; and this is eminently the case when coal gas and oil gas are burned against each other. The quantity of heat liberated is, speaking generally, as the quantity of gas consumed, and this is greatest with the coal gas; but the quantity of light is nearly as the quantity of carbon that is well burnt in the flame; and this is greatest in the oil gas.

The very compact state in which the apparatus necessary for the decomposition of oil can be placed, the slight degree of attention required, its certainty of action, its cleanliness, and the numerous applications which it admits of in use of its furnace for other convenient or economical purposes, render it not only unobjectionable, but useful in manufactories and establishments; and these favourable circumstances are accompanied, not by any inferiority in the flame or increased expense, but by an improved state of the first, and saving in the latter.

Messrs. Taylor's have shewn great ingenuity in the construction of their whole apparatus, but the washer and gasometer deserve particular notice for their remarkable simplicity also. In the washer, two planes are fixed in a box or cistern, in a direction not quite horizontal, but inclined a little in opposite directions; the planes are traversed nearly across by slips of wood or metal, fixed in an inclined position on the under surface, and which alternatively touch one side of the cistern, leaving the other open and free. These two planes being immersed in water, the gas is thrown in under the lowest ridge, and by its ascending power is made to traverse backward and forward along the ridges fixed on the planes, until it escapes at the highest point of the uppermost ridge. Thus, with a pressure of 5 or 6 in. of water only, it is made to pass through a distance of 14 or 16 ft. under the surface of the fluid, and become well washed.

The smaller gasometers are made of thin plate iron, and being placed in a frame of light iron work, look more like ornamental stoves than the bulky appendages to gas apparatus, which they supply. The larger ones are made very light, and when in pieces very portable, by being constructed of a frame of woodwork, in the edges of which are deep narrow grooves; plates of iron fit into these grooves, which being caulked in and painted over, make a light and tight apparatus. These are easily put together in any place, and may therefore be introduced into a small apartment, or other confined space, where a gasometer already made up would not enter.

(*Continued on p. 174*)

In a *Description of the Process of Manufacturing Coal Gas* by Frederick Accum, published 1819, the ensuing remarks were made:

Dr. W. Henry's experiments gave the following results:—100 cubic inches of carburetted hydrogen from coal, require, for burning, 220 cubic inches of oxygen, and produce 100 cubic inches of carbonic acid—100 cubic inches of carburetted hydrogen gas procured from lamp oil, require 190 cubic inches of oxygen, and produce 124 cubic inches of carbonic acid—100 cubic inches of carburetted hydrogen obtained from wax, require 280 cubic inches of oxygen, and produce 137 cubic inches of carbonic acid.

The economy of obtaining gas for the production of light from oil, may be judged of from the following data: One gallon of common whale oil, produces about ninety cubic feet of gas (other experiments produced 105 cubic feet). An Argand burner required a cubic foot and a half of gas per hour; and consequently a gallon of oil when converted into gas, will supply the same burner for sixty hours. The expense of the gas at a moderate price of oil, will be, allowing for coals, labour, &c., for producing the gas, three farthings per hour, and such a burner will give a light, equal in intensity, to two Argand lamps, or ten mould candles.

The expense of an Argand oil lamp, is usually admitted to be about three-halfpence per hour. Now supposing ten candles to be burning, four to the pound (two pound and a half) they will cost 2s. 11d. of which one-tenth part will be consumed in each hour. The cost of the tallow light is then threepence-halfpenny per hour.

If wax candles be employed, the expense of the light equal to an oil gas burner for one hour, by the same mode of reckoning, allowing the candle to burn ten hours, and taking the price of the wax candles, at 4s. 6d. per pound, will be about 14d. The comparative account will therefore stand thus:

	Pence.
Cost of an Argand burner, supplied with oil gas, per hour	0¼
Ditto of an Argand lamp, burning spermaceti oil	3
Ditto of tallow mould candles	3½
Wax candles	14

These calculations on the cost of light from oil gas, are taken at the usual price of good whale oil, but cheaper oils will answer the purpose nearly as well, and as many of these are often to be procured, the whole expense becomes materially reduced by their use.

Domestic Coke Testing

(*Continued from p. 168*)

The softer coke thus reaches a finer state of division than the harder coke, and more soft coke passes through the 25 mesh sieve which retains the minimum size of coke permitted for the test. The sample retained is thus not representative of the original sample and contains more hard coke—*i.e.*, less reactive coke than was present in the original No. 2 coke. The limit is set in the size of coke to be used for the test, as the smaller the coke becomes the greater is the surface area in contact in the fuel bed.

It is evident that the C.A.B. bears only a general relation to the behaviour of a coke in an ordinary grate. It may be that the time taken for the coke to ignite for the C.A.B. test under the standard conditions gives an indication of the time the coke will take to ignite under standard conditions in a domestic grate, but the fact remains that the C.A.B. value only gives an approximate indication of the reactivity of the coke in the open grate.

The relationship between bulk density and combustion rate was examined regarding the cokes produced at the Athol Street, Garston and Southport works of the Liverpool Group. It was soon found that each individual works has a characteristic determined by the carbonizing conditions obtaining at that works, and it would seem that the bulk density is the main factor governing the performance of the coke on an open fire.

Provided the coke is properly screened and contains no oversize, and provided the moisture content does not exceed 8%, the prime factor in determining the performance of a given coke in a domestic grate is its bulk density. The lower the bulk density, the more reactive is the coke. The C.A.B. plays a part in influencing the performance, particularly in the initial stages of combustion. The thermal value of the volatile matter appears to be of little importance in the average vertical coke. The ash is unimportant as long as it does not exceed 10% and it is then effective only during the later stages of combustion. This conclusion may be modified by the nature of the ash.

Bearing these facts in mind, it is possible that a satisfactory method of testing domestic coke would be on the lines of a scaled-up version of the C.A.B. test, using close-screened air dried coke of nut size to minimize the effects of poor screening and excessive moisture. Such a test would eliminate the objections against the small C.A.B. test—*viz.*, the destruction of the porosity and the non-representative nature of the sample. It would also in all probability be more convenient to perform than the fire test. An apparatus on these lines has been constructed at Liverpool and initial tests are being carried out.

WELDING FOR INCREASED PRODUCTIVITY

The Nottingham meeting on increasing production by recent developments in welding and design techniques will be held on Tuesday and Wednesday, February 7 and 8 at the Nottingham Mechanics' Institution, Trinity Square, Nottingham.

This is the sixth of a series of two day meetings arranged by the British Welding Research Association at various centres throughout Great Britain.

Tuesday, February 7

9.30-11.00 a.m., Recent Developments in Welding Steel; A. R. Muir, B.SC.

11.30-1.00 p.m., Effect of design on production with references to fatigue loading; R. Weck, ING., PH.D.

2.30-5.00 p.m., Development in non-destructive testing; H. L. Carson, B.SC., A.INST.P., GRAD.I.E.E.

Chairman—Morning—G. Forster Esq.

Wednesday February 8

9.30-11.00 a.m., Processes for welding light alloys; W. G. Hull, A.I.M.

11.30-1.00 p.m., Resistance welding ferrous and non-ferrous metals; E. V. Beatson, B.SC.(ENG.).

2.30-3.30 p.m., What can be done to reduce fatigue failure and brittle fracture; A. A. Wells, B.SC., PH.D.

4.00-5.00 p.m., The problem of productivity improvement in welded production; A. G. Thompson, B.SC., A.M.I.C.E.

Chairman—Morning—W. C. Cooper, Esq.

Afternoon—Prof. J. A. Pope, PH.D., D.SC., WH.SCH., M.I.MECH.E.

PROGRESS UNDER NATIONALISATION

The Central Electricity Authority has recently published a booklet, entitled *Seven Year Record—1948 to 1955*, which briefly reviews the outstanding developments of electricity supply in Great Britain during the first seven years of national ownership and operation under the British Electricity Authority and the 14 Area Electricity Boards set up by the Electricity Act of 1947. Vesting Day was April 1, 1948, and the data and records cover the period up to March 31, 1955. The national organization was modified by the Electricity Reorganization (Scotland) Act of 1954 which merged the former South West and South East Scotland Electricity Boards, and the corresponding Generation Divisions of the British Electricity Authority into the South of Scotland Electricity Board as from April 1, 1955. At that date the title of the British Electricity Authority was changed to Central Electricity Authority.

TRADE NEWS

Developments in aluminium paints

The need for a decorative paint which will at once provide adequate protection against corrosion, is claimed to be best met by aluminium paints. One of the most important factors is the ability of the aluminium pigment to form a continuous metal film at the surface of the dried paint, thereby making it impervious to ultra-violet light and moisture. Both cause deterioration of paint and varnish vehicles, so that failure in the correct choice of aluminium pigment or vehicle and consequent inability to form a continuous film can lead to paints producing poor corrosion resistance.

A further critical factor is the partial or complete change into a jelly-like substance during storage. This has not until recently been adequately studied. This inherent change is not to be confused with the thickening which results from partial evaporation of thinner or volatile content. As opposed to this, true gelling will not be broken down by thinner because it is due to chemical action within the paints.

It is from such faults that the subsequent problem arises of aluminium paints losing brilliance in storage. For it is through the deterioration of leafing power that coatings expected to give lustrous aluminium finishes often dry to a dull matt with little or none of the high reflectivity imparted by efficient aluminium paint systems.

These problems have been the subject of an impressive programme of research and development carried out by the Stafford Laboratories of Evode, Ltd., whose chemists and paint technologists embarked on a plan of experimental work to produce superior reliable aluminium paints.

Research

Research revealed that aluminium powder, owing to surface tension, will rise to the surface of the paint film and the flakes will interlock to form a continuous film resembling, under the microscope, a tiled surface. The best results were achieved by using aluminium pigments based on pure aluminium of extremely small particle size in the form of flat plates.

An important property of aluminium paints is their ability to withstand heat better than the conventional oil pigmented paints and the research team concentrated on increasing the ability of aluminium paint to withstand very high temperatures by careful blending of the medium and, by increasing the proportion of aluminium pigments. Resistance to the high temperature of 900°F. was achieved with perfect adhesion and good appearance.

Evode Aluminium 302 is an aluminium paint with a bituminous base. It was developed to obtain a smooth surface of silver-white appearance which reflects the heat of the sun. Development beyond this prevented moisture from gaining a hold and, in practical trials, it was found to allow rain to run quickly off roofs. Final tests proved that when this paint was applied to a surface coated with bituminous or asphaltic material, an internal temperature reduction in the order of 10 to 15°F. resulted, and so Evode 303 Silver Film paint was marketed. It is claimed to be proving an extremely versatile paint, because of its success on corrugated sheeting and on metal or concrete surfaces which have been previously treated with roofing felt, bitumen or tar. On asphalt roofs treated with this 303 Silver Film paint, resistance to weather is said to be better than, and heat reflecting properties are equal to, those of conventional finishes on white roofs.

Applications

Aluminium paint is perhaps seen to best advantage in large oil refineries, where paint must be of the highest possible quality and durability to protect vast areas of plant and storage tanks from corrosive attack by weather and by the marine atmosphere enveloping most oil storage depôts. Experience over a long period had previously proved that excellent protective value was achieved when Evo-led primer was applied over thoroughly descaled and cleaned steel and followed by coatings of aluminium paint.

In the shipping industry, recent experiments on the 'Lucy Ashton' proved that a bituminous paint with aluminium pigment provides a surface with about 5% less frictional resistance than a red-oxide type of underwater coating. If underwater paint does not provide adequate protection, metal will be lost by corrosion and there will be increased roughening of surfaces in contact with water. Such roughening is generally caused by detachment of mill scale accompanied by rusting beneath an incomplete paint film. The film these chemists produced in the Evo-led/Evodyne Aluminium paint system is claimed to give a consistent and highly durable protection.

New aluminium pigments and additives are constantly being introduced to meet specific requirements and possibilities are being investigated. New resins such as butyl titanate and silicones, with exceptionally high resistance to heat, are being evaluated and used. Evode 301 Aluminium paint has been developed to particularly fulfil the requirements of power engineers and those concerned with the maintenance of boiler plant and factories; the formula being adjusted for application to the ironwork and lagging of boilers, steam pipes and structural steelwork in boiler houses. This paint has been similarly adjusted with outstanding success to give caravan makers an attractive finish for roofs. It is claimed that aluminium paints have been adopted on a large scale by gas boards throughout Great Britain.—*Evode, Ltd., Stafford.*

Automatic titrations

Baird & Tatlock announce that they have produced an instrument for carrying out Karl Fischer titrations automatically and which will be in production shortly. The apparatus can be used by a relatively unskilled operator who, having placed the sample to be tested in the vessel of the apparatus can carry out the titration merely by pressing a button. The titration proceeds automatically and stops automatically when the end point is reached. The burettes can also be refilled automatically by pressing a button. This instrument is the first of a series of B.T.L. 'Analmatic' instruments.—*Baird & Tatlock (London) Ltd., 14-17, St. Cross St., London, E.C.1.*

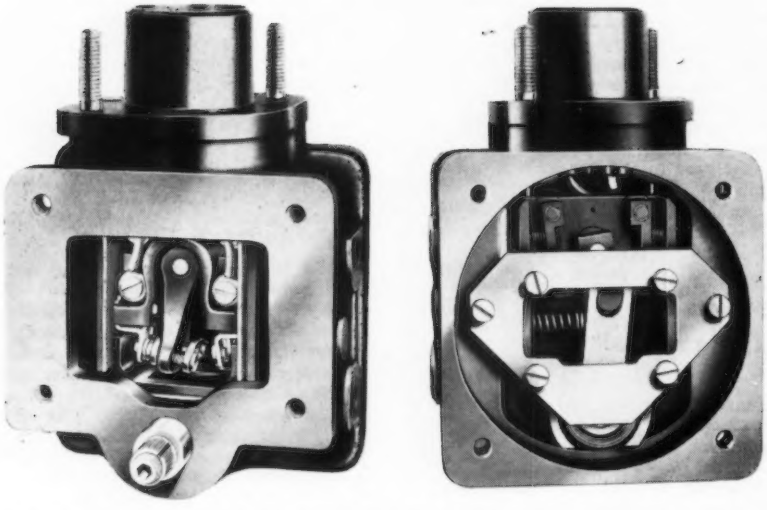
Gas injector

A recently introduced injector for town gas is the Amal Injector Type 354. It has a long venturi and there are models for ¾ in. to 2 in. gas thread burner pipes. It is claimed that all jets calibrated by Amal Ltd., and stamped with the same number will give the same discharge under the same conditions of pressure. The venturis are so made that two or more of the same bore will give the same reduction in pressure. The constancy of

Amal Injector Type 354.

uniform aeration is obtained by the gas stream axis from the jet being within 2° parallel of the axis of the venturi. It is noted that the venturis are purposely slack in their thread to allow for the burner pipe being eccentric with the thread, but this slackness cannot tilt the venturi more than 1°, which is negligible. Large enough gas inlet ports are provided so that whether the gas is taken in parallel or at right angles to the injector there will be no pressure drop and no loss in efficiency.

When it is desired to obtain a soft flame of lower primary aeration, a short choke of the same bore as the long venturi may be used. By comparison it will double the length of the cone; *e.g.*, with the long venturi, the cone is 2 in. long and light sapphire blue in colour; with the short choke, it will be 4 in. long and a green blue colour.—*Amal Ltd., Holdford Road, Witton, Birmingham, 6.*



Left: *Switch with front cover removed to show silver contacts, stainless steel splines for locating operating lever, terminal screws, connections to socket, and projecting insulation to form creep barrier.* Right: *Rear view of switch with backplate removed to show return spring (transferable), overtravel spring, and screws securing snap-lock unit.*

Flameproof limit switch

Following the success of the standard 16D-1200 range of snap-lock limit switches introduced in 1953, a flameproof version has been designed to comply with the requirements of B.S. 229 and 587. For some time, a number of these switches have been used in collieries where their proven satisfactory operation is welcomed by engineers engaged on the development of pit mechanism. The mechanism of the new switch is identical with that of the standard snap-lock design.

Although for colliery work the only protection required is against Class 1 gases, such as methane (fire-damp), the superior workmanship embodied in the flameproof snap-lock switch ensures its safety against Class 2 and 3 gases which include blast furnace gas, hydrocarbons encountered in the petroleum industry, liquids derived from coal tar, many industrial solvents such as cellulose solvents, coal or town gas and coke oven gas. The switch has passed the appropriate tests of the Ministry of Fuel and Power at the Buxton testing station and is licensed to carry the Ministry's official FLP mark.

The flameproof switch is a single-phase, or D.C. double-circuit, or two-way switch having one normally closed and one normally open circuit, which can be reversed by moving the return spring to the side required. With the return spring removed completely the operating lever must be used to reset the switch or make contact in the opposite position, thus providing a double throw switch which is maintained in both positions.

The operating lever is mounted on a splined shaft which not only enables the easy removal and repositioning of the lever, but the splines are such that the operating lever can be adjusted for position in steps of 7.5° throughout a full circle.

The snap-lock unit is mounted in the main body and removal of the front plate exposes the electrical side for examination. The leads from the socket are finished with suitable eyelets and secured under the terminal screws of the unit. Adequate insulation surrounds the terminal blocks to provide the necessary creep barrier to earth. Removal of the complete snap-lock unit is effected by disconnecting the leads from under the terminal screws, taking off the back cover, and withdrawing the two securing screws of the attachment plate. The unit can be lifted out through the back aperture. It may be seen that the attachment plate is cut away to allow the easy removal of the return spring when changing the normally open circuit from one side to the other as required.

The switch is operated by a 10½° movement of the operating lever which has an effective length of 1½ in. The exact position of operation is precise and each switch repeats within very close limits.

The overtravel spring, partially seen behind the bottom of the locating plate, permits 28½° of overtravel in either direction, but it is not recommended that more than 6° be used if the operation is frequent and rapid. In the event of the overtravel being exceeded through faulty mounting or application, a $\frac{5}{32}$ in. diameter by ¼ in. shear pin is fitted to the operating spindle inside the overtravel spring, thereby protecting the switch from complete destruction. The snap-lock design provides a small amount of wiping action between the solid silver contacts on both their 'make' and 'break' actions, a feature which is claimed to ensure extremely long and reliable operation and has contributed in no small measure to the reliability of the switch. The moulded terminal blocks are colour spotted adjacent to the terminal screws and the various insulating blocks in the plug and socket are spotted with the same colour code, thereby preventing as far as possible incorrect wiring of the switch.—*Burton, Griffiths & Co., Ltd., Snap-Lock Division, 93, Albert Embankment, London, S.E.11.*

New World gas range

The New World 3528 range is a straightforward development of its immediate predecessor, the 3518, and has several new or improved features.

All boiling burners and the griddle plate burner light automatically as soon as the taps are turned full on, so long as the pilot flames are alight. There are two pilot flames, housed inconspicuously under the cooking top; one serves two boiling burners, the other serves the other two boiling burners and the griddle plate burner. They are controlled from a single pilot tap located below the cooking top at the front; it is convenient to leave the pilots running continuously and they burn very little gas. Any hotplate burner can then be turned on at once merely by turning the tap full on. The ignition system is based on the flash tube principle with a lighting jet on each burner. A refinement is that should a burner be lighted with a match, the lighting jet on the burner automatically lights as well, so avoiding a smell of unburned gas.

The oven door is now held closed entirely by spring action, with no mechanical latch. To open, the user merely pulls the door by the handle outward and downward and it can of course be left in the fully open horizontal position, as a temporary resting place for dishes of food.

Improvements in appearance include redesign of the central feature in the splashback, polished boiling burner heads

and the application of light alloy fairings around the oven, grill and warmer doors providing complete closure of the small gaps between inner and outer panels seen when the doors are open.—*Radiation Group Sales, Ltd., Radiation House, 7, Stratford Place, London, W.1.*

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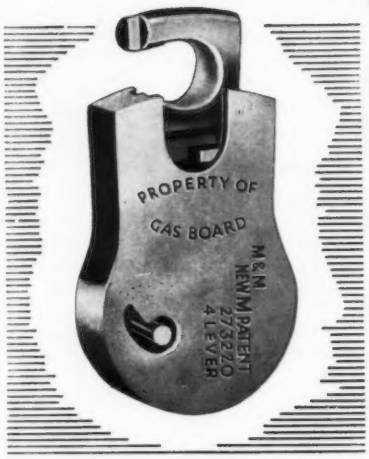

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MIDLANDS MANAGER: G. B. Torrance, 42, Wychall Lane, King's Norton, Birmingham, 30. *Telephone:* King's Norton 3868.

NORTHERN MANAGER: Philip W. B. King, Flat 1, 7 Langcliffe Avenue, Harrogate. *Telephone:* Harrogate 67625.

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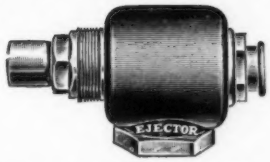

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APPOINTMENTS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 inclusive or a woman aged 18-59 inclusive unless he or she, or the employment, is excepted from the provisions of the Notification of Vacancies Order, 1952.

MANAGER, aged about 35, required for London Company dealing in piping equipment sold to gas and water undertakings. Applicants should have an engineering and manufacturing background and previous experience in management of a company. Sales experience in the U.K. and export markets also desirable. Reply with full details, education and experience. Apply: No. 271, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

THE Bombay Gas Company Limited invite applications for vacancies on the staff at Bombay for:—

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Applications stating age, experience, qualifications, whether married or single, to be addressed to Sir Alexander Gray, Agent in London, Bombay Gas Company Limited, 54, Old Broad Street, London, E.C.2.

SOUTHERN GAS BOARD

STATISTICIAN

APPLICATIONS are invited for the position of STATISTICIAN to the Board. His responsibility will be direct to the Board for all statistical work.

This is a new and pensionable appointment. The salary will be by arrangement with the successful candidate, but will be not less than £1,500 per annum. A professional qualification or University degree is essential, preferably both. Candidates should have had experience in the application of statistical methods to commercial problems and the design and interpretation of sampling procedures.

Applications must be on the form provided, which may be obtained from the Secretary of the Southern Gas Board, 164, Above Bar, Southampton, and returned to him within fourteen days.

SOUTHERN GAS BOARD

INTERNAL AUDITOR AND METHODS OFFICER

APPLICATIONS are invited for the position of INTERNAL AUDITOR and METHODS OFFICER to the Board.

This is a new and pensionable appointment. The successful applicant will be responsible to the Board for all internal audit work and the design of methods throughout the Board's area. At least one professional qualification is essential—some knowledge of electronic computers would be helpful.

The salary will be by arrangement with the successful candidate but will not be less than £2,000 per annum.

Applications must be on the form provided, which may be obtained from the Secretary of the Southern Gas Board, 164, Above Bar, Southampton, and returned to him within fourteen days.

SOUTHERN GAS BOARD

ISLE OF WIGHT GROUP
SENIOR CHEMIST

APPLICATIONS are invited for the position of SENIOR CHEMIST at the new Central Gas Works at East Cowes.

Candidates should have had a comprehensive training and experience in all aspects of chemical control on Gas Works plant. It will be necessary for the successful candidate to prepare the laboratories and equipment in readiness for commencement of gas production at the new Works. A recognised qualification in chemistry would be an advantage.

The salary will be within the range of Grade A.P.T. 7 (£620-£700 per annum) of the National Salary Scales for Gas Staffs. The successful candidate will be required to pass a medical examination and, unless already subject to a pension scheme by virtue of the Gas (Pension Rights) Regulations, 1950, will be required to join the Board's Staff Pension Scheme.

Applications giving full details should be sent to the undersigned on or before January 28, 1956.

G. G. WARNE,
Engineer & General Manager.

Central Offices,
"Rosemount,"
Bellevue Road,
Ryde, I.o.W.

WEST MIDLANDS GAS BOARD

WARWICKSHIRE DIVISION
DISTRICT INSPECTOR, RUGBY DISTRICT

CANDIDATES must possess a sound knowledge of Domestic Appliances, Gasfitting and Consumer Service generally, and should hold the City and Guilds of London Final Certificate for Gasfitting.

The salary will be within Grade 5 (£530/£610 per annum) of the National Salary Scales for Gas Staffs.

The post is pensionable and the successful candidate may be required to pass a medical examination.

Applications stating age, qualifications and experience, together with details of present and previous employment and the names of two referees, should be addressed to Mr. A. Allen, Divisional General Manager, West Midlands Gas Board, Gas Street, Coventry, to reach him not later than January 28, 1956.

J. C. INGRAM,
Secretary to the Board.

SCOTTISH GAS BOARD

NORTHERN DIVISION
APPOINTMENT OF MANAGER TO ELGIN DISTRICT

APPLICATIONS are invited for the position of MANAGER of the Elgin District Gas Undertaking from qualified Gas Engineers experienced in modern Gas Works and distribution practice and in the supervision and administration of a medium sized Undertaking.

The salary applicable to the post, which includes certain responsibilities for neighbouring Undertakings in the Sub-Group, is £920-£1,045 per annum, with free house and fuel allowance.

The successful candidate may be required to pass a medical examination.

Applications giving full particulars of age, qualifications and experience, together with *copies* of three recent Testimonials, should be lodged with the undersigned not later than Saturday, January 28, 1956.

H. S. MILNE,
Divisional Controller.

50, Cotton Street,
Aberdeen.

January 4, 1956

EAST MIDLANDS GAS BOARD

LINCOLNSHIRE DIVISION
TECHNICAL ASSISTANT (DISTRIBUTION)—GRIMSBY GROUP

APPLICATIONS are invited for the above appointment which will be made within Grade A.P.T. 5/6 of the National Salary Scales for Gas Staffs (£530/£645).

Applicants should hold at least the Ordinary Grade Certificate in Gas Engineering (Supply) and have a thorough knowledge of modern methods of distribution, including high and low pressure systems and should be capable of carrying out the detail work in connection with the planning and estimating of new work.

The position is pensionable and the successful applicant will be required to pass a medical examination.

A house is available at a reasonable rent if so required.

Applications, stating age, and giving details of education, training and experience, together with the names of two referees should be addressed to the Group Manager, East Midlands Gas Board, Sheepfold Street, Grimsby, to arrive not later than January 28, 1956.

BERNARD CLARKE,
Divisional General Manager.

WALES GAS BOARD

TECHNICAL HEADQUARTERS
TECHNICAL ASSISTANT

APPLICATIONS are invited for the post of TECHNICAL ASSISTANT to the Gas Engineer and Planning Officer (Production) at Technical Headquarters, Cardiff, of the Wales Gas Board.

The duties of the post will include work in connection with new developments in gas manufacture as well as with established methods and preference will be given to applicants who possess a Higher Grade Certificate (Engineering) of the Institution of Gas Engineers, or equivalent qualification, and who have had Works and Laboratory experience.

The successful applicant will be required to undergo a medical examination and to subscribe to the Board's Superannuation Scheme.

Salary will be within Grade A.P.T. 7 Provincial 'A' (£620/£700 per annum) of the Scales agreed by the National Joint Council for Gas Staffs.

Applications, stating age, experience and qualifications, giving the names of two referees, should be addressed to the undersigned and posted so as to arrive within fourteen days of the appearance of this advertisement.

C. B. MAWER,
Secretary.

2, Windsor Place,
Cardiff.

WALES GAS BOARD

TECHNICAL ASSISTANT (ENGINEERING), PONTYPOOL UNDERTAKING

APPLICATIONS are invited from suitably qualified persons for the position of TECHNICAL ASSISTANT (ENGINEERING) to the Pontypool Undertaking.

The successful applicant will be required to prepare drawings and specifications for gasworks plant and to supervise erection, and must have good Drawing Office experience. Possession of a Higher National Certificate in Engineering is essential, and experience with Contractors would be an advantage.

The commencing salary will be within grades APT 8 or 9 (Provincial A), £660-£800 per annum of the National Salary Scale for Gas Staffs, placing according to experience and qualifications.

The position is pensionable, and the successful candidate may be required to pass a medical examination.

Applications stating age, qualifications and experience, together with details of present and previous appointments and the names of two referees, should be received by the undersigned within fourteen days of the appearance of this advertisement.

A. FACER,
General Manager.

Gas Offices,
Hanbury Road,
Pontypool, Mon.

INDUSTRIAL Gas Fitter required. Preferably a young man studying for the Higher Grade Certificate in Gas Engineering (Supply). Must be willing to travel throughout the country. Knowledge of Oil and Coke firing an advantage, but tuition will be given. Excellent opportunity. Apply: Mr. J. L. Goodwill, Managing Director, Modern Furnaces and Stoves Ltd., Booth Street, Handsworth, Birmingham 21.

CHIEF DRAUGHTSMAN in London, with at least 10 years' experience gasworks and gas plant manufacture. Age preferably 45-55. Only men fully conversant with drawing office routine and capable of supervising drawing office dealing with projects from layout design details will be considered. Existing pension scheme would be taken over. Write in confidence giving age, experience and salary required, to No. 274, *Gas Journal*, 11, Bolt Court, Fleet Street, London, E.C.4.

EASTERN GAS BOARD

IPSWICH DIVISION
DRAUGHTSMAN—CHELMSFORD GROUP

APPLICATIONS are invited for the position of DRAUGHTSMAN at the Chelmsford Group Headquarters.

The salary will be in Grade 6—Provincial 'A' of the A.P.T. scales (£565/£645 per annum).

The successful candidate may be required to pass a medical examination and, unless already subject to a pension scheme by virtue of the Gas (Pension Rights) Regulations, 1950, will be required, if eligible, to join the Board's Staff Pension Scheme within six months from taking up the appointment. Applications, stating age, qualifications and experience, should be addressed to the undersigned to reach him not later than January 31.

F. N. HOWES,
Group Manager.

Gas Works,
Chelmsford,
Essex.

January 3, 1956.

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FOR SALE: NEW GAS-FIRED BOILER by Hartley & Sugden. 160 lbs./hour at 80 lbs. p.s.i., complete with chimney, spare burner and controls. Original purchase price was £419. Our price £200. W. H. COLLINGBOURNE & CO., LTD., 1481, Stratford Road, Birmingham, 28. Phone: Shirley 3303.

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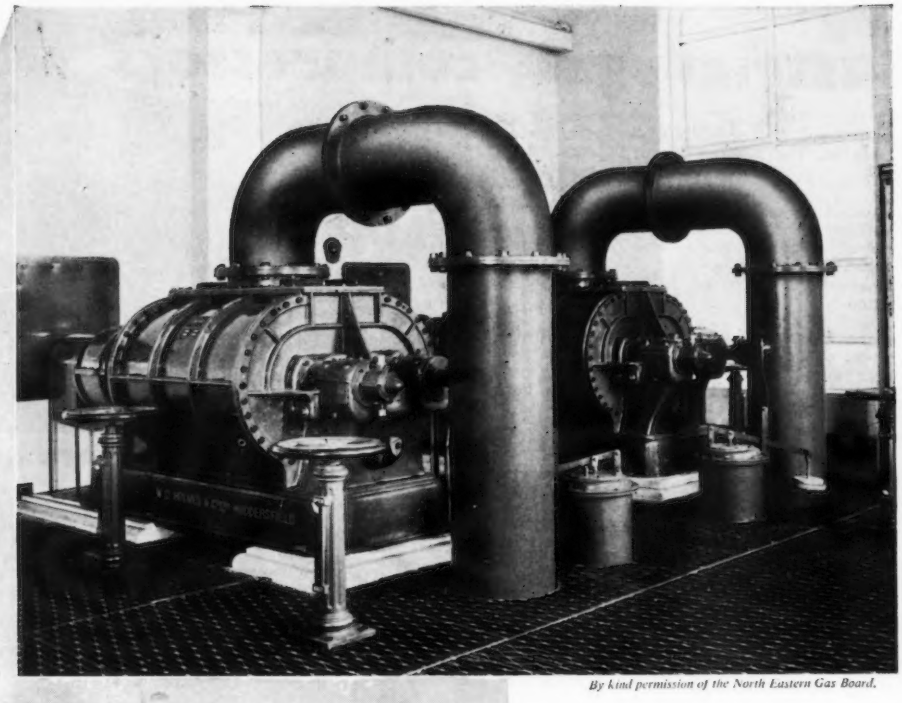

By kind permission of the North Eastern Gas Board.

Holmes-Connersville Boosters

Two — 20″ x 50″ Holmes-Connersville Gas Boosters one with diesel drive and the other with electric drive installed at the New Wortley Works, Leeds.

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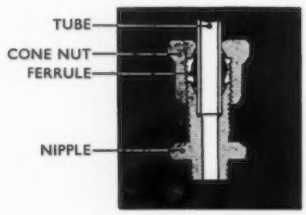
FOR COMPRESSING AIR OR GAS SUPPLIES USED FOR FURNACE HEATING, METAL MELTING, BRAZING, SOLDERING BITS, LAUNDRY IRONS, ETC.

DIRECT COUPLED COMPRESSORS (see *illustration right*) *are fitted with automatic internal by-pass valves and lubrication systems. They are direct coupled to Keith Blackman motors. Type OA compressors in this range occupy a floor space of only 18" x 7½".*
CAPACITY RANGE: *100 to 750 cub. ft. of gas or air per hour at 3 lbs. per sq. in. pressure.*

TYPE 4 COMPRESSORS *(not illustrated) are also fitted with automatic internal by-pass valves and lubricators. The complete unit includes motor and drive on a common bedplate, all of Keith Blackman manufacture.*
CAPACITY RANGE: *500 to 20,000 cub. ft. of gas or air per hour at 3-5 lbs. per sq. in. pressure.*
AREA OCCUPIED: *from 9¼" x 16½" to 61" x 27".*

DID YOU KNOW?

KEITH BLACKMAN have been making compression joints for many years and the present design embodies features developed as a result of this long experience. *Notice that the shape of the ferrule is such that the joint is made without unduly stressing the tube.*



serving to burn

Note: the four burner heads (right) are for high pressure gas, or low pressure gas and air blast.

LEFT: "Fishtail" type burner *with two-armed stamped pattern injector for heating liquid in tanks by submerged combustion tubes. For use with low pressure gas supplies.* ***Size Range:*** *1", 1¼", 1½", 2" and 2½" outlets.* ***Capacity Range:*** *45-280 cub. ft. of gas per hour.*

Brass non-blow-off head types: *deal with 5 to 10 cub. ft. of gas per hour.*

Stainless steel, "F" type head, burner: *deals with 8 cub. ft. of gas per hour.*

Perforated head type burner: *deals with 10 to 15 cub. ft. of gas per hour.*

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MILL MEAD ROAD, TOTTENHAM, LONDON, N.17
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AT THE STEEL COMPANY OF WALES WORKS

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WEST
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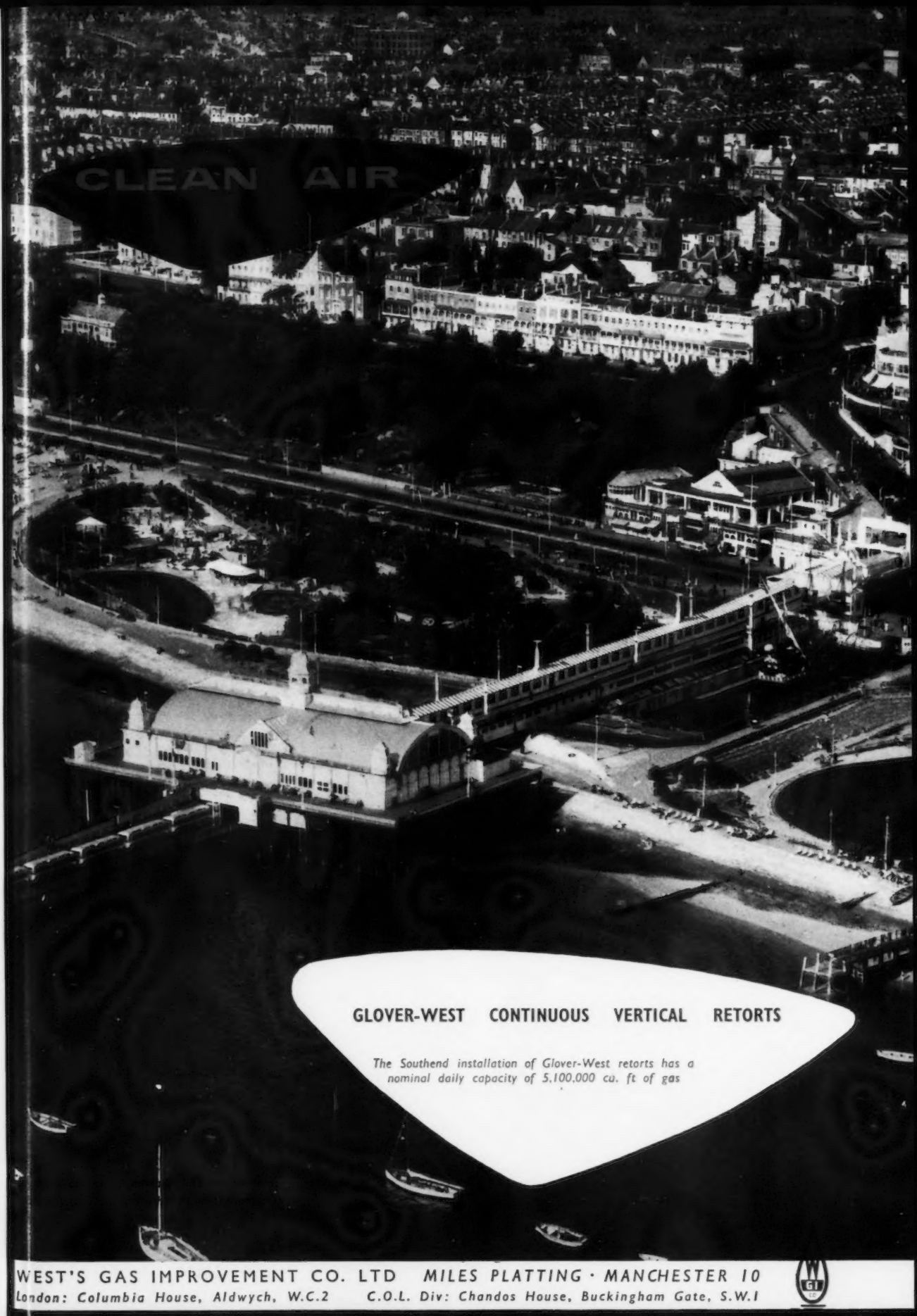

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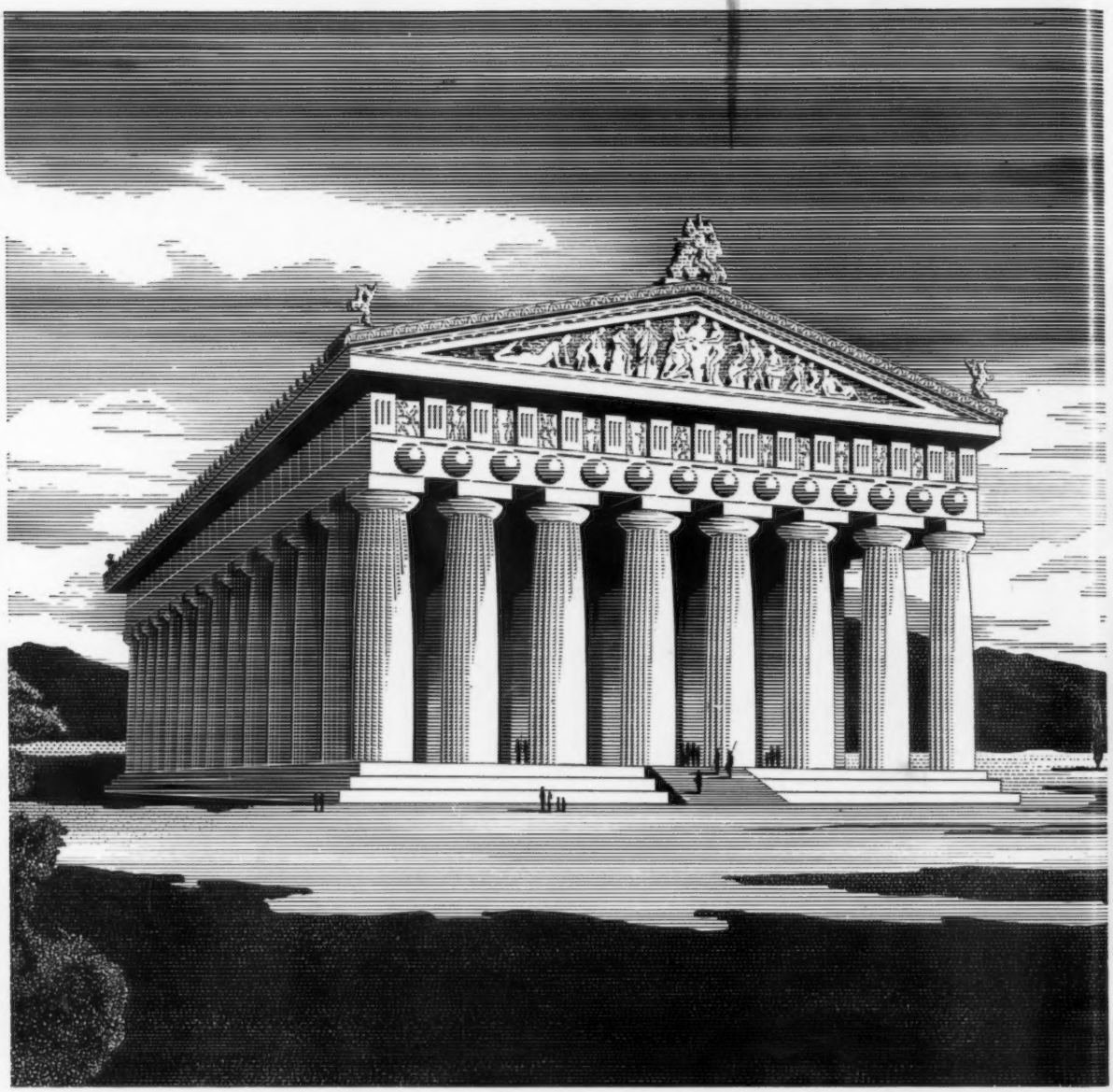

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